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Protecting healthcare workers against the psychological impact of COVID-19: A systematic review of interventions for frontline responders

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ABSTRACT

Objectives: Protecting healthcare workers from psychological harm is an urgent clinical issue within the current COVID-19 climate. Psychological programs that aim to prevent post-traumatic symptoms and have been tested in frontline responders in previous disaster situations can assist service providers with choosing a suitable intervention for rapid dissemination in healthcare settings. This paper (i) conducted a systematic review of psychological interventions administered to frontline responders exposed to mass trauma or major disasters, and (ii) discussed the suitability of implementing these programs within the healthcare workforce.

Design and outcome measures: First, Embase, Web of Science, PsycINFO, and Google Scholar were searched through a systematic literature review of trauma prevention programs administered to frontline disaster responders in the last 15 years. Measures included psychological functioning outcomes of distress and positive change. Second, the suitability of these psychological programs for healthcare workers was evaluated according to the criteria of effectiveness, content applicability, and feasibility.

Results: Of 315 articles retrieved, 12 studies were identified describing a total of six preventative psychological interventions. Psychological First Aid (PFA) and Eye Movement Desensitization and Reprocessing (EMDR) had the strongest evidence-base with frontline workers, followed by the Resilience and Coping for the Healthcare Community (RCHC), Anticipate, Plan, and Deter (APD), and Trauma Risk Management (TRiM) programs. In contrast, Immediate Cognitive-Functional Psychological First Aid (ICF-PFA) requires further research. With regards to other suitability criteria, all programs were applicable to healthcare settings and had varying degrees of feasibility for rapid implementation.

Conclusions: Several suitable interventions were identified as suitable and potentially useful to improve the psychological functioning of healthcare workers across a variety of disaster situations. Service providers should continue to implement and evaluate preventative psychological interventions in frontline workers in order to achieve best practices for managing the psychological impact of future disasters.

Abstract word count: 294

Article Summary:

- Protecting healthcare workers from psychological harm is an urgent clinical issue within the current COVID-19 climate that be informed by research with all frontline responders.
- A systematic review was conducted of preventative psychological interventions for frontline responders exposed to mass trauma or major disasters. Identified programs were summarized and evaluated for suitability of implementation in the healthcare workforce.
- For the systematic review, Embase, Web of Science, PsycINFO, and Google Scholar were searched for empirical articles within the last 15 years.
- Suitability of programs for use with healthcare workers was assessed using a health evaluation framework of effectiveness, content applicability, and feasibility of implementation.
- This study provides evidence-based and practical information that can guide health service providers in their decisions on how to best support the psychological needs of healthcare staff.

Strengths and Limitations:

- This is a timely review given the COVID-19 crisis and the limited evidence-based information on preventative psychological programs for frontline and healthcare workers.
- Practical suitability of each program was carefully considered, to address the need for rapid and widespread implementation of psychological support in the healthcare workforce.
- Despite multiple databases searched and a rigorous review process, it is possible that there are other suitable programs not identified by this review paper.
- Given the chaotic nature of health services when dealing with mass trauma or disasters, there may also be existing programs that have not yet received formal evaluation.

INTRODUCTION

Health decision-makers are currently seeking information on how to provide the best psychological assistance to our healthcare workers. Working in the frontline during mass disaster events can have a major impact on mental health, such as increased rates of acute stress disorder, post-traumatic stress disorder (PTSD), anxiety, and depression,(1,2) which may lead to further consequences of substance abuse and suicide risk.(3) In many cases, this psychological impact may have a delayed-onset, with symptoms only developing several months or years after the traumatic event.(4) It is therefore important for frontline services to implement effective preventative measures that seek to mitigate ongoing psychological distress and minimize the development of post-traumatic symptoms.(5) However, organizations require knowledge of evidence-based information about the available psychological programs before they can make well-informed decisions on how to best assist their staff. By providing this information, the current study seeks to guide the response of health service providers during current and future disasters.

The novel severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) or COVID-19 pandemic(6) has led to a sharp increase in demand for health and social care workers such as nurses, doctors, paramedics, and forensic workers as well as other security personnel such as police officers and the military.(7) These 'frontline' responders share similar experiences of trauma and are required to continuously work under highly stressful conditions. COVID-19 has brought additional workplace stressors to healthcare workers due to fears of contracting the virus and infecting others, difficulties accessing personal protective equipment, burnout, stigma, discrimination from the public, and heightened emotional burden.(8) These stressors have triggered elevated rates of psychological distress in healthcare workers such as depression, anxiety, and PTSD,(9,10) creating concern over a secondary mental health crisis.(11)

There have been urgent calls for health services to respond to these mental health concerns in the workforce. Initial assistance has included the provision of practical help through infection control procedures, access to protection equipment, and responding to other basic physical needs.(12) Staff are also encouraged to contact crisis helplines and psychological support services if symptoms persist. (13) In addition, early psychological strategies are equally important in preventing the short and long-term impacts of disaster events on mental health.(14) Recent research has recommended that frontline responders should receive early intervention within the first few months of the traumatic event.(15,16) However, there is currently no consistent implementation of preventative psychological interventions across frontline workforces.

One major barrier to implementation is the lack of accessible information regarding suitable psychological interventions. Indeed, there is a paucity of early psychological interventions designed specifically for healthcare workers, which can be rapidly implemented across health organizations. A potential solution to this issue is to examine existing psychological programs that have been administered and tested in 'frontline' responders during previous disasters and pandemics and review whether these programs are relevant and practical for implementation within healthcare services. The key objective of this paper was therefore to provide evidence-based and practical information to assist health service providers in deciding how best to protect the mental health of their staff.

Specifically, this review aimed to (i) identify and summarize psychological intervention programs that were administered to minimize psychological harm in frontline disaster responders using a systematic review, and (ii) review the potential suitability and applicability of these interventions to the healthcare workforce using a healthcare evaluation framework. The findings were synthesized and discussed in terms of practical implementation and further research. For each program, its objective, content, endorsements, effectiveness, and feasibility for use in the healthcare workforce is described.

METHODOLOGY

Our methodology involved (i) a systematic review of psychological intervention programs designed to prevent the development of mental health issues and tested in frontline responders, defined here as individuals trained to provide services in emergency or disaster settings, such as healthcare workers or security forces; and (ii) a health service evaluation framework that reviewed the suitability of each program for healthcare workers based on the criteria of effectiveness, content applicability, and feasibility of implementation.(17)

Systematic Review

For the systematic review, a single reviewer searched for psychological intervention programs designed to prevent the development of mental health issues that were tested in frontline responders. Identified records were examined twice by the single reviewer to minimize error and the final articles were reviewed by a second author. The search and reporting strategy followed PRISMA guidelines(18) and was conducted in July 2020 across Embase, Web of Science, PsycINFO, Google Scholar, and cross-referencing of reference lists. Using the appropriate search term strategy for each database, the Ovid searches included the following keywords:

(Health care worker* OR healthcare worker* OR health care staff OR healthcare staff OR medical staff OR medical worker* OR frontline worker* OR frontline staff) AND (mental health OR psychological impact OR PTSD OR post-traumatic stress* OR anxiety OR depression) AND (prevent* OR intervention*) AND (covid-19 OR coronavirus OR outbreak* OR epidemic* OR pandemic* OR disaster).

The terms were used as free text words. Articles were first screened for relevance to the topic by their title and abstract and if they appeared suitable then the full text was downloaded (see Figure 1). Risk of bias was assessed at the review process and study levels, according to ROBIS guidelines.(19) Studies were summarized based on their tested population, disaster context, study design, follow-up, and outcome measures.

Eligibility Criteria. Studies with psychological intervention programs to prevent mental health issues in frontline responders, published within the last 15 years, and delivered within the first three months of a disaster were included. Empirical studies and doctoral theses with a clear theoretical framework, longitudinal research design with psychological outcome measurements, and a post-treatment follow-up were included. In contrast, non-psychological (e.g. medical, drug, and physical) interventions, non-English studies, and purely descriptive, qualitative, or case study designs were excluded. Studies were excluded if they described symptom reduction after the onset of a mental health disorder, instead of symptom prevention, such as trauma-focused CBT.(20) Finally, studies were excluded if the proposed intervention program is explicitly recommended against by clinical practice guidelines, such as psychological debriefing.(21,22)

Health-Service Evaluation Framework

After intervention programs were identified through the systematic review, they were rated on their suitability for healthcare workers, based on criteria adapted from an evaluation framework for healthcare programs.(17) Specifically, each program was evaluated using three core components; (i) effectiveness, in this case for reducing psychological distress and increasing positive psychological outcomes (e.g. self-efficacy); (ii) content applicability to healthcare settings, to determine whether the theoretical content is sound and whether its components can plausibly support healthcare workers; and (iii) feasibility of implementation, including accessibility and cost.

RESULTS

Study selection

The search strategy in the systematic literature review identified 315 potentially relevant articles, including 305 within the databases of PsycINFO, Embase, and Web of Science, and an additional 10 articles through manually searching Google Scholar and reference lists (Figure 1). After duplicates were removed and titles and abstracts were screened for relevance, 25 full-texts of articles were downloaded. Fourteen studies were excluded in the full-text screening stage. Finally, a total of 12 studies were identified (11 articles, indicated by * in the reference list; see Table 1). Risk of bias was assessed in the review process and the only risk identified was the absence of a second reviewer. Risk of bias was also assessed at the study level, which showed that the study by Farchi et al(23) did not meet eligibility criteria due to participants not being frontline responders. However, as participants witnessed a traumatic incident and were trained in delivery of the intervention, this study was still included in the suitability evaluation section.

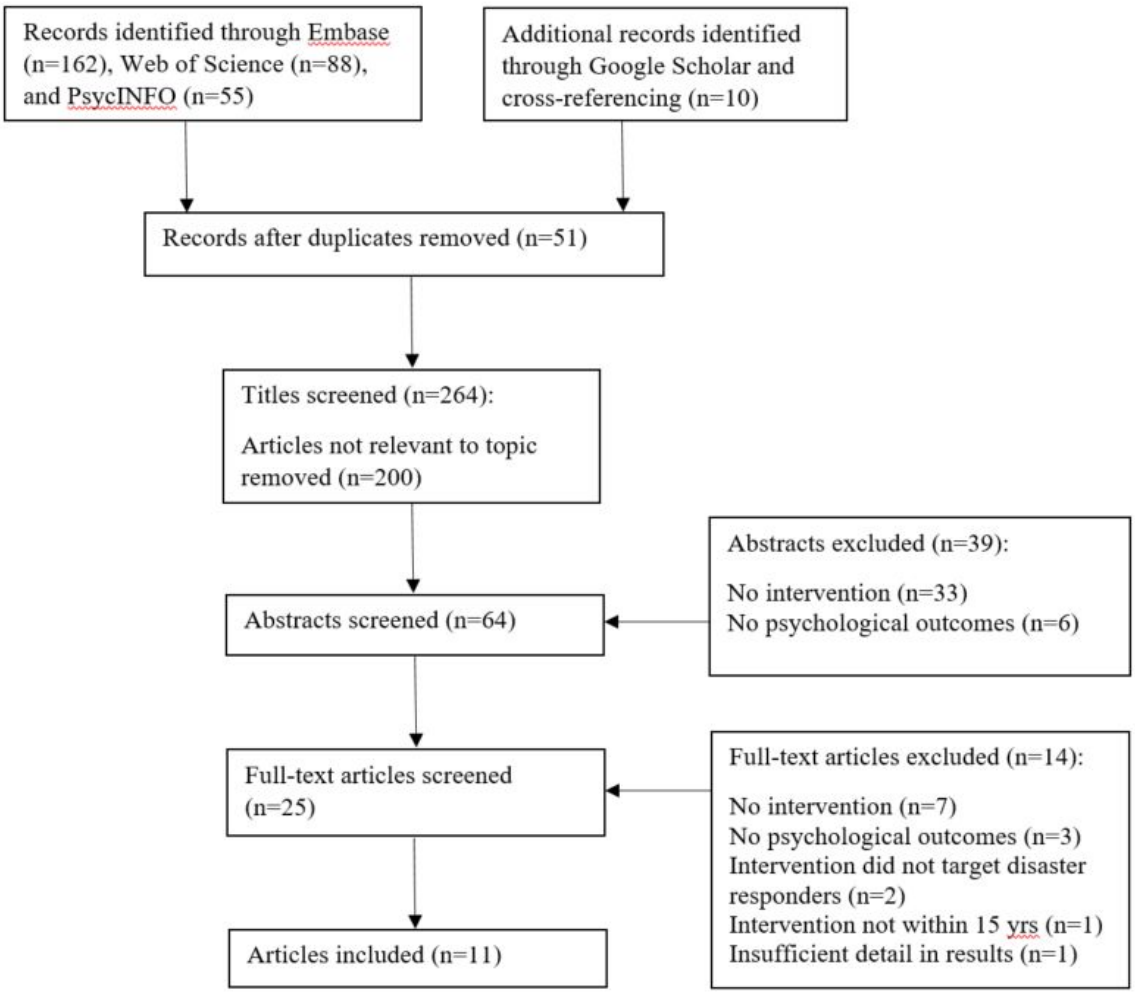

Figure 1. Study flow diagram.

Table 1. Evidence-base for preventative psychological interventions with frontline disaster responders

Authors	Intervention	Participants and Context	Study Design	Key Findings and Outcomes
Psychological first aid (PFA)				
Cheung, 2014 (24): Study 2	Single day of pre-disaster PFA training	802 disaster responders: 458 in intervention group and 460 in waitlist control group. Various local and overseas disasters and mass gathering events, Hong Kong	RCT design, 3 and 6-month follow-ups	The intervention group showed increased self-efficacy (pilot tested 13-item scale) at follow-ups, compared to controls. The control group had increased general psychopathology (GHQ-28), adaptive coping (Brief-COPE), and life satisfaction (6-item scale) scores across time, whereas the intervention group remained unchanged. No other outcomes showed significant differences between groups (8-item PFA knowledge scale, DASS-21, IES-R. CD-RISC, MSPSS).
Cheung, 2014(24): Study 3	Single day of pre-disaster PFA training	110 disaster responders: 51 had PFA training and 59 had no PFA training. Major maritime vessel collision, Hong Kong	Cross-sectional design, 2-month follow-up	Same outcome variables and measures were used as above. The PFA group reported greater levels of self-efficacy, PFA knowledge, coping, resilience, life satisfaction, and social support compared to the control group. There were no other outcomes differences.
Reed, 2013(25)	8-hour community-based PFA training	21 emergency medical first responders received the intervention, unspecified controls. Local disasters, South Dakota, USA	RCT design, unspecified follow-up	Greater perceived PFA knowledge (knowledge of PFA questionnaire) predicted greater resilience (CD-RISC). Self-stigma (SSOSH) decreased from pre to post-PFA training.
Immediate cognitive-functional psychological first aid (ICF-PFA)				
Farchi et al, 2018(23): Study 2	2-day ICF-PFA training, 3 hours per day	155 high-school students trained as ICF-PFA providers: 69 in intervention, 86 controls. Unexpected car crash fatality after training, Tel-Hai, Israel	RCT design, 2-week and 3-month follow-ups	Increased general self-efficacy (GSE), professional self-efficacy (PSE), and resilience (CD-RISC), and reduced perceived stress levels (PSS) at follow-ups, compared to controls.
Eye movement desensitization and reprocessing (EMDR)				
Jarero and Uribe, 2012(26)	Single individual session of EMDR-PRECI, lasting 1.5-2 hours	32 forensic personnel with moderate or severe post-traumatic stress: 18 in treatment group (severe scores), 14 in waitlist group (moderate scores). Human massacre disaster in Durango, Mexico	RCT design, post-treatment and 3 and 5-month follow-ups	Significant improvement found in both PTSD measures (IES-R, SPRINT) at post-treatment and a further significant reduction at follow-ups, compared to the control group.
Jarero et al, 2013(27)	Two 1.5-hour individual sessions of EMDR-PROPARA	39 first responders in active duty: 19 received intervention, 20 received supportive counselling. Various local disasters, Sonara, Mexico	RCT design, post-treatment and 1 and 3-month follow-ups	Significant improvement in PTSD symptoms (SPRINT) at post-treatment and both follow-ups, compared to the control group.

Anticipate, plan, and deter (APD) responder risk and resilience model				
Schreiber et al, 2019(28)	The full APD Responder Risk and Resilience Model	45 US Ebola medical providers trained in APD, across two groups that were deployed to West Africa at different times	Cross-sectional design, over a 2 month period	PsySTART-R psychological risk factor trends identified and targeted with the 'deter' phase. The first deployed group showed greater cumulative risk factors than the second group after qualitative feedback implemented (10% vs 1% respectively). Good usability reported.
Resilience and coping for the healthcare community (RCHC)				
Powell and Yuma-Guerrero, 2016(29)	3-hour RCHC program	69 healthcare or social service workers across 6 health, social service, and disaster response organizations	Quasi-experimental, post-intervention and 3-week follow-up	Perceived knowledge on four domains (7 questions) increased and acute stress levels (SACL) decreased from pre to post-intervention. Perceived knowledge and social support (Social Provisions Scale) increased at follow-up. No other outcomes showed significant differences (PSS, ProQOL, Ways of Coping, CSE).
Trauma risk management (TRiM)				
Frappell-Cooke et al, 2010(30)	Evaluation of existing TRiM program	Compared two groups: 86 British army personnel in initial stages of using TRiM and 94 British Royal Marines personnel with extensive use of TRiM, deployed in Afghanistan	Quasi-experimental, outcomes measured halfway during deployment and in the week after returning home	Better general mental health (GHQ-12) and decreased PTSD symptoms (PCL-C) at post-deployment than pre and during deployment, especially for group with extensive use of TRiM.
Greenberg et al, 2010(31)	Evaluation of existing TRiM program	638 British military personnel: 6 Royal Navy warships for intervention condition and 597 personnel in 6 ships for control condition. Exposure to various natural disasters and injuries, UK	Cluster RCT design, 12-18 month follow-up	No significant difference found between groups for general psychopathology (GHQ-12), PTSD symptoms (PCL-C), or self-stigma (internal and external questions). However, history of minor disciplinary offense rates were significantly lower in the intervention group, suggesting better occupational functioning.
Watson and Andrews, 2018(32)	Evaluation of existing TRiM program	693 police officers across 3 forces using TRiM, 166 police officers across 2 forces not using TRiM. Various local disasters, UK	Cross-sectional design, unspecified follow-up	The TRiM forces reported lower levels of PTSD symptoms (PCL-C), fewer barriers to help-seeking (Stigma and Barriers to Care Questionnaire), and reduced public stigma (MSS), than the non-TRiM forces.
Hunt et al, 2013(33)	TRiM program	640 police officers: 44 given briefing, 44 given briefing and 1:1, 166 given 1:1, and 386 given no intervention. Exposure to mass shooting event in Cumbria, UK	Cross-sectional design, 2-month follow-up	The TRiM intervention program showed reduced occupation impact (absenteeism rates) when sociodemographic factors were adjusted, especially for junior officers. TRiM scores improved across time in the intervention group, although were significantly higher in the intervention group than control group at baseline and follow-up.

PFA = Psychological First Aid; RCT = Randomized Controlled Trial; GHQ-28 =General Health Questionnaire-12; DASS-21 = Depression, Anxiety and Stress Scales – Short Form; IES-R = Impact of Event Scale – Revised; CD-RISC = Connor-Davidson Resilience Scale; MSPSS = Multidimensional Scale of Perceived Social Support; SSOSH = Self-Stigma of Seeking Help; EMDR-PRECI = Eye Movement Desensitization and Reprocessing Protocol for Recent Critical Incidents; PTSD = Post-Traumatic Stress Disorder; SPRINT = Short Post-Traumatic Stress Disorder Rating Interview; EMDR-PROPARA = EMDR Protocol for Paraprofessional Use; APD = Anticipate, Plan, and Deter; RCHC = Resilience and Coping for the Healthcare Community; SACL = Stress Arousal Checklist; PSS = Perceived Stress Scale; ProQOL = Professional Quality of Life; CSE = Coping Self-Efficacy Scale; TRiM = Trauma Risk Management; PCL-C = PTSD Checklist-Civilian; MSS = Military Stigma Scale.

Summary of Study Characteristics

Six psychological intervention programs were identified. The included programs were tested in frontline responder populations of medical and paramedic workers, military forces, police officers, forensic workers, and other non-professionals trained to respond to emergency or disaster situations (see Table 1). Disaster contexts included Ebola,(28) human massacres,(26,33) military deployment,(30) car crash fatalities,(23) maritime collisions,(24) and other various local disasters.(24,25,27,29,31,32) There were six randomized controlled trials (RCTs),(23–27,31) four cross-sectional studies,(24,28,32,33) and two quasi-experimental designs.(29,30) Follow-up periods ranged from one week to 18 months (where specified).

The included studies used a variety of measures across the outcome domains of psychological distress (GHQ and DASS-21 for psychopathology; PSS and SACL for stress; IES-R, SPRINT, and PCL-C for PTSD) and positive psychological change (Brief-COPE, Ways of Coping, and CSE for coping; CD-RISC for resilience; GSE and PSE for self-efficacy; 6-item questionnaire for life satisfaction; ProQOL for quality of life; PFA knowledge questionnaire for perceived knowledge). Additional outcomes included perceived stigma and barriers (MSS and internal and external stigma questionnaire for stigma; Stigma and Barriers to Care Questionnaire for barriers to help-seeking) and occupational functioning (history of minor disciplinary offence rates and absenteeism rates).

Psychological Intervention Programs

Psychological first aid (PFA) is a widely used psychological program for disaster situations that provides access to emotional, social and physical support.(34) It aims to reduce short and long-term effects of disasters and traumatic events through promoting adaptive functioning and coping. It also offers practical care and immediate support via empathic listening and information on psychosocial services. It is based on the concept of resilience and involves five empirically supported disaster and mass trauma intervention principles, which include promoting a sense of (a) safety, (b) calming, (c) self- and community-efficacy, (d) connectedness, and (e) hope.(34) It has eight core helping actions and goals that are described in Table 2.(35)

Immediate cognitive-functional psychological first aid (ICF-PFA) aims to target symptoms of the acute stress reaction by drawing on neuropsychological and psychological theories of stress and resilience.(23) It uses the SIX Cs model of cognitive communication, challenge, control, commitment, and continuity to shift the individual to a more active, cognitive-based reaction state. It was developed to address limitations of current PFA guidelines, since Farchi et al(23) propose that PFA principles may lead to an increased sense of helplessness and its intended delivery of hours or days after the traumatic event may be too late to reduce or prevent acute stress reactions.(36,37)

Additionally, PFA has general guidelines and principles but no formal protocol management system, thus requires personal judgment from the provider. Instead, ICF-PFA facilitates a sense of autonomy in managing stressful events, is delivered in the immediate minutes or hours following the perceived traumatic event, and has more directive and structured guidelines.(23)

Eye movement desensitization and reprocessing (EMDR) is a psychotherapy treatment specifically designed to alleviate PTSD and other trauma-related symptoms.(38) EMDR was developed based on the theoretical framework of Adaptive Information Processing (AIP), which assumes that trauma symptoms arise from adverse life events being inadequately processed within the brain and stored as traumatic memories that continue to resurface.(39) In this intervention, a trained EMDR practitioner guides the person to relive their original trauma memory in brief doses whilst making rapid eye movements, instead of the memory being locked in the nervous system in the form of thoughts, emotions, and sensory information about the episode.(40) EMDR has sub-protocols for early intervention in the immediate days and weeks following disaster events, such as the recent traumatic episode protocol (R-TEP),(41) group traumatic episode protocol (G-TEP),(42) and protocol for recent critical incidents (PRECI).(43)

Anticipate, plan, and deter (APD) responder risk and resilience model aims to assess and manage psychological risk and resilience in healthcare workers and their families across pre-incident, response, and recovery stages of public health emergencies.(28) Specifically, the APD model consists of a three-step action plan, with the 'anticipate' phase involving pre-event stress inoculation training to prepare healthcare personnel for the psychosocial impact of mass trauma events. In the 'plan' phase, staff develop a personal resilience plan, where they can identify and document their expected stress responses and challenges as well as support systems and coping strategies. The final 'deter' phase involves teaching staff how and when to activate their personal resilience plan during stress exposure and encouraging them to use the Psychological Simple Triage and Rapid Treatment–Responder (PsySTART-R) self-triage system. PsySTART-R is a web-based mobile-friendly application and self-assessment tool that tracks daily exposure to traumatic stress, assesses psychological risk factors, and gives confidential feedback.

Resilience and coping for the healthcare community (RCHC) is a recent post-disaster intervention designed to reduce psychological distress and increase resilience in healthcare and social service providers.(44) Specifically, it aims to build healthy coping strategies for dealing with past, current, and future disasters and foster resilience through promoting support between colleagues. It combines psychoeducation and mindfulness practices in an interactive group-work format that uses solution-focused techniques and action learning theory. There are 5 core modules; common reactions to stress, how the brain reacts to severe stress and trauma, healthcare provider responses

to stress and traumatic events, coping with stress and trauma with individual strategies, and coping with stress and trauma with collective strategies.

Trauma risk management (TRiM) is a well-established peer support intervention for first responders that aims to mitigate psychological risk from potentially traumatic events by identifying high risk individuals and matching them to the appropriate care.(45) Participation is voluntary and careful consideration is made regarding who it is offered to. Trained management personnel first hold a planning meeting with everyone involved in the potentially traumatic event, to better understand the incident and agree upon a tailored response. In the next stage, TRiM practitioners run basic psycho-educational briefings to cover the specific incident as well as how to manage responses. Lastly, high-risk individuals are asked to take part in a semi-structured risk assessment interview and are linked with appropriate psychological support. Essentially, TRiM provides a framework for organizations to monitor and effectively manage the psychological impact of potentially traumatic events in their employees.

Health-Service Evaluation Framework

The following section evaluates each program within the healthcare workforce, based on the criteria of effectiveness, content applicability, and feasibility with this population. A snapshot summary of the objective, content, endorsements, effectiveness, feasibility, and overall suitability for healthcare settings is summarized in Table 2 below.

Table 2. Snapshot summary of the six preventative psychological intervention programs

Intervention	Objectives	Endorsements and Effectiveness	Content	Feasibility	Suitability for HCW
PFA	Promotes adaptive functioning and coping in all disaster victims by providing access to information and support	Endorsed by the WHO and APS for general crisis support; suggested by multiple studies as suitable for frontline workers	Based on 5 trauma intervention principles and 8 core actions and goals (contact/ engagement; safety/comfort, stabilization, assessment of needs, practical assistance, connection with social supports, coping strategies, linkage with appropriate services)	Deliverable by non-professionals; free guides online and training course at a cost (see text)	Effectiveness: Yes* Content applicability: Yes Feasibility: Yes
ICF-PFA	Targets acute stress reactions in all disaster victims by providing sense of autonomy immediately after event	Recognized and implemented as the national PFA model in Israel, has sub-protocol for first responders but no empirical research	SIX Cs model, based on neuro-psychological and psychological theories of stress and resilience	Deliverable by non-professionals; no manual online; contact authors via email (see text)	Effectiveness: No* Content applicability: Yes Feasibility: No
EMDR	Targets trauma-related symptoms in all trauma victims by guided reliving of trauma memory	Endorsed as a trauma intervention by the WHO, APS, and APA, amongst others; has empirical evidence for PTSD	Based on adaptive information processing (AIP) model and reprocessing of trauma memory in brain; has 8-phase treatment structure	Requires trained EMDR practitioner; several free sub-protocols online, overall manual can be purchased (see text)	Effectiveness: Yes* (for PTSD) Content applicability: Yes Feasibility: Yes
APD	Assesses and manages psychological risk and resilience in healthcare workers at pre/during/post stages of disaster	Evaluated in one study and currently undergoing evaluation in West China Hospital and Minnesota, USA during COVID-19	Involves stress inoculation training, building a personal resilience plan, and activating the plan whilst using the PsySTART-R self-triage system	Requires organization to implement and monitor; free instructor guide online (see text)	Effectiveness: Some* Content applicability: Yes Feasibility: Yes
RCHC	Seeks to mitigate post-disaster distress and build resilience in healthcare and social service providers	Recently implemented in response to several natural disasters in the USA; one empirical study, funded by AmeriCares	Based on the risk and resilience framework; combines psycho-education, group work, and mindfulness into 5 core modules	Requires trained RCHC facilitator; free facilitator guide online (see text)	Effectiveness: Some* Content applicability: Yes Feasibility: Yes
TRiM	Peer support intervention for first responders that identifies high risk individuals and matches them to appropriate care	Developed for the British police force and military, now recommended as peer-support initiative across UK; mixed empirical evidence, may improve occupational functioning	Based on trauma-informed care principles and involves stepped management phases	Volunteer personnel trained as TRiM practitioners (2-day course). Free handbooks for trauma victims (see text), no practitioner manual online	Effectiveness: Some* Content applicability: Yes Feasibility: Yes

HCW = HealthCare Workers. WHO = World Health Organization; APS = Australian Psychological Society; APA = American Psychiatric Association. *Effectiveness classified as 'yes' if program tested in two or more studies, 'some' if one study, and 'none' if no studies.

Psychological first aid (PFA)

Effectiveness. The evidence-base for PFA is somewhat mixed. Despite being one of the most widely known and used programs in the general community(46) as well as endorsed by the World Health Organization(47) and Australian Psychological Society,(48) it has limited empirical evidence.(49) To our knowledge, there has been no empirical study in which frontline workers were the direct recipients of PFA. However, three studies reported on the mental health benefits to frontline workers after receiving PFA training (see Table 2). After a single day of training, psychological benefits were reported in medical healthcare staff(25) and other professional and non-professional first responders.(24) These benefits included improvements in positive psychological outcomes of resilience, self-efficacy, perceived knowledge, and social support. Reductions in perceived self-stigma was also found. However, there was no direct evidence for improvements in general psychopathology, coping, or life satisfaction compared to controls. The authors suggest that PFA has psychological benefits for the person delivering it, in addition to their recipients, as it teaches coping strategies and facilitates connection with support systems and services, which can be used to protect the self as well as support others.

Content applicability. PFA is a generic disaster relief approach that can be implemented either during or immediately after the disaster and can apply to anyone impacted by the event. Its broad spectrum response strategy makes it easily generalizable to multiple population groups and settings with a variety of psychological needs. It allows for local adaptations, thus is suitable for healthcare workers.

Feasibility. PFA training typically runs for a single day. Specialized mental health practitioners are not required to deliver PFA, although it assumes that trainees have basic knowledge in helping someone with distress. Short training courses in delivering PFA are available to people wishing to assist others after a traumatic event. Costs are variable, but can be minimized through group training, train the trainee schemes, and online training (see Textbox 1).

Immediate cognitive-functional psychological first aid (ICF-PFA)

Effectiveness. ICF-PFA is a novel approach that has not explicitly been evaluated in the context of frontline or healthcare personnel. Nevertheless, it showed promising results of reducing stress and improving resilience and self-efficacy within adolescent students who received training in delivering ICF-PFA and subsequently experienced the trauma of an unexpected car crash fatality of a participant, compared to the control condition.(23) This study suggests that, similar to PFA, training in delivering ICF-PFA may alleviate psychological impact. One likely reason for this is that ICF-PFA trainees learn effective coping techniques for the immediate aftermath of disaster exposure, such as

achieving simple tasks to improve their sense of control. Indeed, the Israeli Defence Forces are in the process of evaluating the impact of ICF-PFA training in frontline soldiers,(23) although further empirical research is required before ICF-PFA can be suggested as an effective intervention for healthcare workers.

Content applicability. ICF-PFA has a strong theoretical framework. Similar to PFA, ICF-PFA was designed for anyone who has experienced mass trauma exposure. Therefore, it is applicable to healthcare responders as well as community victims who have witnessed a significant traumatic disaster. Moreover, the content of ICF-PFA appears relevant for people both receiving and delivering the intervention.

Feasibility. ICF-PFA can be administered in one or two days. Any professional or non-professional who has received adequate training in ICF-PFA can deliver this intervention. ICF-PFA has a sub-protocol for first responders in Israel, where it is recognized by the Israeli Ministry of Health as the National PFA model and has been adopted by Israeli government, education, security, police, and defence sectors. However, ICF-PFA protocols are not readily available online (see Textbox 1).

Eye movement desensitization and reprocessing (EMDR)

Effectiveness. Despite continuous skepticism from the scientific community,(50) EMDR is steadily becoming a popular and well-established intervention for treating trauma-related symptoms.(51) It is also endorsed by the World Health Organization,(52) amongst others.(21,53,54) Reduced PTSD symptoms have been found across forensic personnel and first responders receiving EMDR intervention.(26,27) Given that healthcare professionals share similar workplace experiences to other frontline staff, EMDR appears a very applicable intervention for reducing PTSD rates in this population.

Content applicability. The Protocol for Paraprofessional use in acute trauma situations (PROPARA) was developed as an early EMDR intervention specifically for first responders.(27) Like other early intervention models, it follows the same eight-phase structure as the standard treatment protocol,(55,56) yet differs in the specific processing techniques used and how the traumatic episode is conceptualized.[29,40] PROPARA would need no further adaption for use with healthcare workers who experience trauma or disaster events. Other early EMDR interventions may also be easily adapted to suit the support needs of the healthcare workforce.

Feasibility. Early EMDR intervention typically runs for a couple of hours, whereas the standard intervention spreads across several days. An EMDR practitioner with specialist training must deliver EMDR therapy to ensure correct delivery, although there are several early EMDR intervention protocols available online.

Anticipate, plan, and deter (APD) responder risk and resilience model

Effectiveness. There is limited evaluation of the APD model in the literature. In one recent study, however, the full APD model was implemented in medical healthcare providers during the Ebola crisis, who showed reduced psychological risk factors across time.(28) The APD model is part of a two-stage psychological rehabilitation plan currently underway in West China Hospital, which seeks to prevent further psychological impact of COVID-19 on healthcare workers. The APD model is also part of a larger psychological intervention study for healthcare organizations to provide to their staff during the COVID-19 pandemic, currently undergoing evaluation in Minnesota.(57) Whilst research on the APD model is in its infancy, it has shown promising effectiveness in healthcare workers.

Content applicability. The APD model was explicitly intended as a psychological intervention for healthcare workers, with theoretical frameworks of risk and resilience tailored to suit this population. Therefore, its content is already applicable to healthcare settings.

Feasibility. The APD risk and resilience model requires the organization to implement the system throughout all stages of disaster response and regularly monitor risk. Therefore, it is relatively resource intensive compared to other programs, as it would need to be continuously managed over time. See Textbox 1 for a full instructor guide.

Resilience and coping for the healthcare community (RCHC)

Effectiveness. The RCHC intervention has demonstrated some effectiveness at reducing psychological impact in healthcare workers, producing positive psychological outcomes of increased perceived knowledge and social support and decreased acute stress levels in a single study.(29) RCHC was recently implemented in several other areas also affected by natural disasters in the USA, such as typhoon-affected Saipan in 2015 and flood-affected Shreveport in 2017, and is currently undergoing evaluation as a recovery response strategy for Hurricane Harvey in Texas and Hurricane Maria in Puerto Rico, funded by AmeriCares.(44)

Content applicability. The RCHC uses a risk and resilience framework that has been carefully adapted for use with healthcare and social service providers. Therefore, this intervention is very suitable for the healthcare workforce.

Feasibility. The RCHC can be delivered to staff in three hours and a trained RCHC facilitator is required to deliver the intervention. There is no full manual available online (see Textbox 1).

Trauma risk management (TRiM)

Effectiveness. The TRiM program has had mixed findings regarding its psychological impact in police officers and the military.(30–32,58) However, there is evidence to suggest it can reduce stigma and

barriers to help-seeking as well as improve occupational functioning in these populations.(31–33) The overlap in traumatic workplace experiences between healthcare and other frontline workers suggests that the TRiM program would show similar results in healthcare settings.

Content applicability. Initially developed in the British military and used within police officers, TRiM is now used by many different organizations across the UK. It offers an evidence-based framework for early indication of who may go on to develop mental health symptoms after a traumatic event and how this should be managed to ensure the best conditions for psychological recovery. This framework is generic enough that it is also suitable for use in healthcare settings.

Feasibility. The TRiM program is intended to be delivered by volunteer personnel within the organization, ideally from a managerial position. TRiM practitioner courses typically run over two or more days. Several TRiM handbooks designed for trauma victims are available online (see Textbox 1).

Textbox 1. **Links to more information on each program.**

Psychological first aid (PFA)

There are several free PFA guides available online. The World Health Organization(47) provides a guide in 30 languages, accessible via the link: https://www.who.int/mental_health/publications/guide_field_workers/en/ The Australian Red Cross provides another PFA guide endorsed by the Australian Psychological Society,(48) accessible via the link: https://www.redcross.org.au/getmedia/dc21542f-16e4-44ba-8e3a-4f6b907bba6f/Psychological-First-Aid-An-Australian-Guide-04-20.pdf.aspx

Immediate cognitive-functioning psychological first aid (ICF-PFA)

ICF-PFA protocols are not readily available online. To access further information on this intervention, contact Farchi et al(23) at: moshefar@telhai.ac.il

Eye movement desensitization and reprocessing (EMDR)

A comprehensive practice manual by Marilyn Luber(59) can be purchased online that contains models, scripted protocols, and summary sheets for early EMDR intervention. An overview and protocol manual is available for free for EMDR R-TEP(43): https://emdrresearchfoundation.org/toolkit/rtep-manual.pdf; for EMDR-PRECI(60): https://emdrresearchfoundation.org/toolkit/preci.pdf; and for EMDR G-TEP(61): https://emdrresearchfoundation.org/toolkit/gtep.pdf

The anticipate, plan, and deter (APD) responder risk and resilience model

An instructor guide for the APD model with relevant worksheets(62) is freely available online: http://file.lacounty.gov/SDSInter/dhs/221064_AnticipatePlanandDeterInstructorManual-FINAL.pdf

Resilience and coping for the healthcare community (RCHC)

Whilst the full RCHC manual is not available online, the author can be contacted at: paula.yuma@colostate.edu and more information on each module(44) can be found at: https://digitalcommons.library.tmc.edu/jfs/vol19/iss1/8

Trauma Risk Management (TRiM)

Several TRiM handbooks designed for trauma victims are available online. For more information on TRiM training, see(63): http://www.marchonstress.com/page/p/trim_faqs, or the TRiM handbook by the British Royal Navy(64): http://c69011.r11.cf3.rackcdn.com/d951c5627eb44b3789e84292d1e2c1fa-0x0.pdf, or the TRiM handbook by the UK Hampshire Fire and Rescue Service and Hampshire Constabulary(65): https://documents.hants.gov.uk/corprhantsweb/Traumahandbook.pdf

DISCUSSION

The key objective of this paper was to equip health service providers with practical information regarding how to protect the mental health of healthcare and other frontline workers. The available evidence was reviewed for psychological interventions designed to prevent post-traumatic stress and further psychological harm in frontline workers during recent disease outbreaks and disasters. Each included program was described based on its effectiveness, content applicability, and feasibility with the healthcare workforce, in order to provide a mental health response guide for service providers.

Six preventative psychological interventions were identified. Based on our review, PFA and EMDR appear to be the most suitable interventions for use with healthcare workers at present. These interventions currently have the most evidence in frontline disaster responders in addition to being applicable and feasible for rapid implementation within the healthcare workforce. Specifically, these interventions demonstrated improved psychological outcomes at follow-ups across at least two RCTs, with several positive outcomes found with PFA(24,25) and reduced PTSD levels consistently found with EMDR.(26,27) However, the evidence-base for PFA involves frontline workers receiving training in PFA delivery rather than as direct recipients of the intervention. Furthermore, both interventions are more generic approaches that were designed to prevent psychological impact in any disaster victims including frontline responders. Whilst this allows these interventions to be easily adapted, their flexible contents can be difficult to formally evaluate and assess.

The APD and RCHC programs are relatively new psychological programs that have shown promising psychological outcomes with healthcare workers and might also be suitable for rapid implementation in this population.(28,29) Both were specifically intended for healthcare workers, thus may be more tailored to suit this population than PFA and EMDR. Nevertheless, they have both only been assessed in a single study without a control condition and require further evaluation. Given that ICF-PFA was recently proposed as an improved, structured, and more immediate version of PFA, it might also be considered as a potential alternative disaster relief approach to PFA.(23) However, it requires future testing in frontline staff to confirm any advantage it may hold over PFA. Due to inconsistent findings across various studies with frontline responders, TRiM also requires further research.(58)

Empirical research on the effectiveness of early psychological interventions for preventing post-traumatic and other mental health symptoms in frontline and healthcare workers is somewhat limited, with few RCTs available and most interventions targeting community disaster victims. It is possible that several other suitable interventions exist that have not yet been formally evaluated.

However, this is understandable given the chaotic nature of health services when dealing with mass traumas and disasters. One potential limitation of this paper is that, due to the rapid need for a review in this area, only three databases were searched. Additionally, articles were searched by a single reviewer. It is possible that relevant studies were missed. Despite limitations, the available evidence can still be used to guide health services in implementing prevention programs that might proactively address the mental health fallout of the current COVID-19 crisis, as well as future pandemics and other mass health and trauma crises. This review has outlined several interventions that have been tested to varying degrees in frontline workers during disease outbreaks and disasters, which also appear suitable for implementation with healthcare personnel.

Whilst the process and prioritization of research can be challenging in the context of mass trauma events, this is an essential area of development. Health systems play a crucial role in evaluating the interventions they implement, in order to build the much needed evidence-base for preventing psychological impact in healthcare workers and elucidating best practices for services in managing future disasters. Health services are typically vigilant to addressing the physical safety of staff in the workplace and the psychological safety of staff must also be given equal priority. Indeed, health services have a duty of care to equip their staff with support and psychological skills to prevent the mental health challenges they will inevitably face as part of their courageous frontline work they do for the benefit of the broader community, particularly during times of mass crises. This review of the evidence for preventative psychological interventions within frontline staff and the consideration of suitability for healthcare settings is intended to be a helpful resource to guide health services seeking to select an intervention to suit the needs of their organization and its employees.

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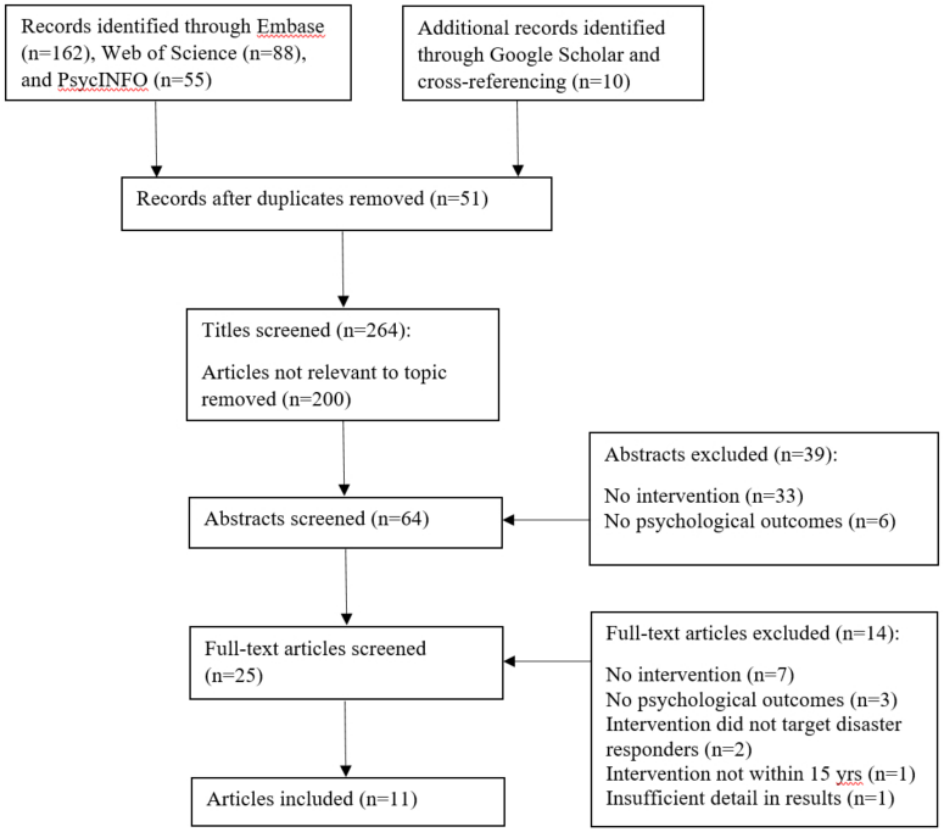

Figure 1. Study flow diagram.

Figure 1. Study flow diagram.

Reporting checklist for systematic review and meta-analysis.

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		Reporting Item	Page Number
Title			
	#1	Identify the report as a systematic review, meta-analysis, or both.	1
Abstract			

Structured summary	#2	Provide a structured summary including, as applicable: background; objectives; data sources; study eligibility criteria, participants, and interventions; study appraisal and synthesis methods; results; limitations; conclusions and implications of key findings; systematic review registration number	2
Introduction			
Rationale	#3	Describe the rationale for the review in the context of what is already known.	4
Objectives	#4	Provide an explicit statement of questions being addressed with reference to participants, interventions, comparisons, outcomes, and study design (PICOS).	5
Methods			
Protocol and registration	#5	Indicate if a review protocol exists, if and where it can be accessed (e.g., Web address) and, if available, provide registration information including the registration number.	5
Eligibility criteria	#6	Specify study characteristics (e.g., PICOS, length of follow-up) and report characteristics (e.g., years considered, language, publication status) used as criteria for eligibility, giving rational	6
Information sources	#7	Describe all information sources in the search (e.g., databases with dates of coverage, contact with study authors to identify additional studies) and date last searched.	5

Search	#8	Present full electronic search strategy for at least one database, including any limits used, such that it could be repeated.	6
Study selection	#9	State the process for selecting studies (i.e., for screening, for determining eligibility, for inclusion in the systematic review, and, if applicable, for inclusion in the meta-analysis).	6
Data collection process	#10	Describe the method of data extraction from reports (e.g., piloted forms, independently by two reviewers) and any processes for obtaining and confirming data from investigators.	5,6
Data items	#11	List and define all variables for which data were sought (e.g., PICOS, funding sources), and any assumptions and simplifications made.	5,6
Risk of bias in individual studies	#12	Describe methods used for assessing risk of bias in individual studies (including specification of whether this was done at the study or outcome level, or both), and how this information is to be used in any data synthesis.	6
Summary measures	#13	State the principal summary measures (e.g., risk ratio, difference in means).	6
Planned methods of analysis	#14	Describe the methods of handling data and combining results of studies, if done, including measures of consistency (e.g., I2) for each meta-analysis.	5

Risk of bias across studies	#15	Specify any assessment of risk of bias that may affect the cumulative evidence (e.g., publication bias, selective reporting within studies).	6
Additional analyses	#16	Describe methods of additional analyses (e.g., sensitivity or subgroup analyses, meta-regression), if done, indicating which were pre-specified.	5
Results			
Study selection	#17	Give numbers of studies screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally with a flow diagram.	6,7
Study characteristics	#18	For each study, present characteristics for which data were extracted (e.g., study size, PICOS, follow-up period) and provide the citation.	8,9
Risk of bias within studies	#19	Present data on risk of bias of each study and, if available, any outcome-level assessment (see Item 12).	7
Results of individual studies	#20	For all outcomes considered (benefits and harms), present, for each study: (a) simple summary data for each intervention group and (b) effect estimates and confidence intervals, ideally with a forest plot.	8,9
Synthesis of results	#21	Present the main results of the review. If meta-analyses are done, include for each, confidence intervals and measures of consistency.	13

Risk of bias across studies	#22	Present results of any assessment of risk of bias across studies (see Item 15).	7
Additional analysis	#23	Give results of additional analyses, if done (e.g., sensitivity or subgroup analyses, meta-regression [see Item 16]).	8,9
Discussion			
Summary of Evidence	#24	Summarize the main findings, including the strength of evidence for each main outcome; consider their relevance to key groups (e.g., health care providers, users, and policy makers	19
Limitations	#25	Discuss limitations at study and outcome level (e.g., risk of bias), and at review level (e.g., incomplete retrieval of identified research, reporting bias).	20
Conclusions	#26	Provide a general interpretation of the results in the context of other evidence, and implications for future research.	20
Funding			
Funding	#27	Describe sources of funding or other support (e.g., supply of data) for the systematic review; role of funders for the systematic review.	21

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Addressing the psychological impact of COVID-19 on healthcare workers: Learning from a systematic review of early interventions for frontline disaster responders

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Addressing the psychological impact of COVID-19 on healthcare workers: Learning from a systematic review of early interventions for frontline disaster responders

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ABSTRACT

Objectives: Protecting healthcare workers from psychological harm is an urgent clinical issue within the current COVID-19 pandemic. Research on early psychological programs that aim to prevent or reduce mental health symptoms and that have been tested in frontline disaster responders may assist service providers with choosing a suitable intervention for rapid dissemination in healthcare settings.

Design and outcome measures: First, Embase, Web of Science, PsycINFO, and Google Scholar were searched through a systematic literature review of early psychological interventions administered to frontline disaster responders in the last 15 years. Interventions were included if they were designed to prevent or reduce psychological impact and had outcome measures of psychological distress (e.g. general psychopathology, PTSD, and stress) and positive mental health domains (e.g. resilience, self-efficacy, and life satisfaction). Second, the suitability of these programs for the healthcare workforce was evaluated according to the criteria of effectiveness, content applicability, and feasibility.

Results: Of 320 articles retrieved, 12 relevant studies were included that described six early psychological interventions. Although the evidence-base for all interventions is limited, Psychological First Aid (PFA) and Eye Movement Desensitization and Reprocessing (EMDR) showed effectiveness across multiple studies with frontline workers. Resilience and Coping for the Healthcare Community (RCHC), Anticipate, Plan, and Deter (APD), and Resilience at Work (RAW) programs found promising results in single studies. Overall, there was mixed evidence for Trauma Risk Management (TRiM). Concerning other suitability criteria, all programs appear applicable to healthcare settings and have acceptable feasibility for rapid implementation.

Conclusions: Despite the limited evidence-base, several suitable interventions were identified as possibly suitable and useful for improving psychological functioning of healthcare workers across a variety of disaster situations. Service providers should continue to implement and evaluate early psychological interventions in frontline workers in order to refine best practices for managing the psychological impact of future disasters.

Abstract word count: 300

Strengths and Limitations:

- This is a timely review given the current COVID-19 crisis and the limited availability of evidence-based information on early psychological interventions for healthcare workers and other frontline disaster responders.
- Practical suitability of each program was carefully considered, to address the need for rapid and widespread implementation of psychological support in the healthcare workforce.
- Despite multiple databases searched and a rigorous review process, it is possible that there are other suitable programs not identified by this review paper.
- Given the chaotic nature of healthcare services when dealing with mass trauma or disasters, there may also be existing programs that have not yet received formal evaluation.

INTRODUCTION

Healthcare decision-makers are continually seeking information on how to provide the best psychological assistance to workers. In particular, working in the frontline during local and global disasters involves repeated exposure to traumatic events, which can have a major impact on mental health such as increased rates of acute stress disorder, post-traumatic stress disorder (PTSD), anxiety, and depression.(1,2) Continued psychological distress may lead to further adverse outcomes of substance abuse and suicide risk(3) as well as burnout, compassion fatigue, and secondary traumatization.(4,5) In contrast, positive mental health domains such as resilience may serve to protect the mental health of first responders.(6) In many cases, psychological harm may have a delayed-onset, with symptoms only developing several months or years after the traumatic event.(7) It is therefore important for healthcare services to implement effective early intervention measures that seek to mitigate ongoing psychological distress and minimize the development of post-traumatic symptoms in the workforce.(8) However, organizations require evidence-based information about available psychological programs before they can make well-informed decisions on how to assist the mental health needs of their staff. By reviewing this information, the current study seeks to guide the response of healthcare service providers during current and future disasters.

The novel severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) or COVID-19 pandemic(9) has led to a sharp increase in demand for frontline health and social care workers such as nurses, doctors, paramedics, and forensic workers as well as other security personnel including police officers and the military.(10) This demand is exacerbated by the chronic shortage of staff within frontline services and even greater shortage during the current COVID-19 climate due to quarantine, sick leave, and increased personal demands from looking after children out of school.(11) As a result, these frontline responders have elevated workloads and are expected to work long hours under highly stressful conditions. COVID-19 has brought further workplace stressors to healthcare workers due to fears of contracting the virus and infecting others, difficulties accessing personal protective equipment, stigma, discrimination from the public, and heightened emotional burden.(12) These stressors have triggered elevated rates of psychological distress in healthcare workers such as depression, anxiety, and PTSD(13,14) and may indeed have secondary effects such as burnout and compassion fatigue, creating concern over a subsequent mental health crisis.(15)

Healthcare services have an obligation to respond swiftly to mental health concerns in the workforce. Initial assistance has included organization-wide provision of non-psychological practical help through infection control procedures, access to protection equipment, and response to other

basic physical needs.(16) There is also a wealth of ad-hoc stress management instructions available online to healthcare workers during COVID-19, which provide lists of basic educational information about psychological self-care and help-seeking. Staff are encouraged to contact personal crisis helplines and professional support services if mental health symptoms persist, with cognitive-behavioural therapy (CBT) interventions (e.g. trauma-focused CBT) endorsed as an effective long-term treatment option for the reduction of ongoing psychological symptoms.(11,17,18) However, such individualized interventions may be of little use as they require active help-seeking behaviour and stigma regarding mental health has been identified as a substantial barrier to seeking psychological support amongst healthcare workers.(19)

The provision of early psychological interventions to all trauma-exposed individuals may be equally as important for preventing and minimizing the short and long-term negative impacts of traumatic events on mental health as delayed intervention after symptom onset.(20) Recent research has recommended that disaster responders should receive early psychological intervention within the first few months of the traumatic event.(21,22) However, there is currently no consistent implementation of early psychological interventions amongst trauma-exposed workforces. One major barrier to implementation is the lack of accessible information regarding early psychological interventions suitable for disaster workers. Furthermore, there is a paucity of research that has tested the effectiveness of these early interventions specifically within healthcare providers. Despite obvious differences in job demands across various frontline services and disaster situations, these workers all face frequent trauma exposure within the workplace.(4,5) A potential solution to this issue is therefore to examine psychological programs that have been administered and tested in *all* frontline responders during previous disasters and pandemics and review whether these programs are relevant and practical for rapid implementation within healthcare services. The key objective of this paper was therefore to provide evidence-based and practical information to assist healthcare service providers in deciding how best to protect the mental health of their staff, drawing on research from various frontline workforces.

Specifically, this review aimed to (i) identify and summarize recent early psychological intervention programs that were administered to prevent or minimize psychological harm in frontline disaster responders, through a systematic review; and (ii) assess the potential suitability of implementing these interventions within the healthcare workforce using a healthcare service evaluation framework.

METHODOLOGY

Our methodology involved (i) a systematic review of early psychological intervention programs tested in frontline responders; and (ii) a healthcare service evaluation framework that reviewed the suitability of each program for widespread implementation across healthcare workers based on the criteria of effectiveness, content applicability, and feasibility of delivery.(23) Frontline workers are defined here as individuals trained to provide services in emergency or disaster settings, such as healthcare workers and security forces. Early psychological interventions are programs designed to prevent or reduce mental health issues from trauma exposure, through increasing positive mental health outcomes such as resilience, coping, and life satisfaction and/or reducing negative mental health outcomes such as PTSD, depression, and anxiety. Psychological programs may involve person-directed interventions using individual or group format and structural interventions to improve mental health response of the whole organization.

Systematic Review

For the systematic review, a single reviewer searched for early psychological intervention programs that aim to prevent or reduce mental health issues and that have been tested in frontline responders. The single reviewer examined the identified records twice to minimize error and a second author reviewed the final articles. The search and reporting strategy followed PRISMA guidelines(24) and was conducted in July 2020 across Embase, Web of Science, PsycINFO, Google Scholar, and cross-referencing of reference lists. Using the appropriate search term strategy for each database, the Ovid searches included the following keywords:

(Health care worker* OR healthcare worker* OR health care staff OR healthcare staff OR medical staff OR medical worker* OR frontline worker* OR frontline staff) AND (mental health OR psychological impact OR PTSD OR post-traumatic stress* OR anxiety OR depression) AND (prevent* OR intervention*) AND (covid-19 OR coronavirus OR outbreak* OR epidemic* OR pandemic* OR disaster).

The terms were used as free text words. Articles were first screened for relevance to the topic by their title and abstract and if they appeared suitable then the full text was downloaded (see Figure 1). Risk of bias was assessed at the review process and study levels, according to ROBIS guidelines.(25) Studies were summarized based on their tested population, disaster context, study design, follow-up, and outcome measures.

Eligibility Criteria

- Early psychological interventions designed to prevent the development of mental health issues at pre, during, or post-disaster stages or to reduce mental health issues with delivery commencing within three months of exposure to a traumatic event
- Intervention tested in frontline disaster responders
- Empirical studies and doctoral theses with a clear theoretical framework that is based on psychological theory
- Psychological outcome measurements of positive or negative mental health domains
- Longitudinal research design with a baseline and post-treatment follow-up(s)
- Published within the last 15 years

In contrast, non-psychological (e.g. medical, drug, and physical) interventions, non-English studies, and purely descriptive, qualitative, or case study designs were excluded. Finally, studies were excluded if the proposed intervention program is explicitly recommended against by clinical practice guidelines, such as psychological debriefing.(26,27)

Healthcare Service Evaluation Framework

After intervention programs were identified through the systematic review, they were rated on their suitability for implementation within healthcare workplaces, based on criteria adapted from an evaluation framework for healthcare programs.(23) Each program was evaluated using three core components of; (i) effectiveness, in this case for reducing psychological distress outcomes or increasing positive psychological outcomes; (ii) content applicability to healthcare settings, to determine whether the theoretical content and program components are relevant for healthcare workers; and (iii) feasibility of implementation, including ease of delivery, accessibility, and cost.

Patient and Public Involvement

There was no patient involvement due to the nature of the review.

RESULTS

Study selection

The search strategy in the systematic literature review identified 320 potentially relevant articles, including 305 within the databases of PsycINFO, Embase, and Web of Science, and an additional 15 articles through manually searching Google Scholar and cross-referencing of reference lists (Figure 1). After duplicates were removed and titles and abstracts were screened for relevance, 30 full-texts

of articles were downloaded. Nineteen studies were excluded in the full-text screening stage. Finally, a total of 12 studies were identified (11 articles, indicated by * in the reference list; see Table 1). Risk of bias was assessed in the review process and the only risk identified was the absence of a second reviewer. Risk of bias was also assessed at the study level, which showed that the study by Farchi et al(28) did not meet eligibility criteria due to participants not being frontline responders and was therefore excluded.

----------Figure 1----------

Table 1. Evidence-base for early psychological interventions with frontline disaster responders

Authors	Intervention	Participants and Context	Study Design	Key Findings and Outcomes
Psychological first aid (PFA)				
Cheung, 2014 (29): Study 2	Single day of pre-disaster PFA training	802 disaster responders: 458 in intervention group and 460 in waitlist control group. Various local and overseas disasters and mass gathering events, Hong Kong	RCT design, 3 and 6-month follow-ups	The intervention group showed increased self-efficacy (pilot tested 13-item scale) at follow-ups, compared to controls. Paradoxically, the control group had increased general psychopathology (GHQ-28), adaptive coping (Brief-COPE), and life satisfaction (6-item scale) scores across time, whereas the intervention group remained unchanged for these measures. No other outcomes showed significant differences between groups (8-item PFA knowledge scale, DASS-21, IES-R. CD-RISC, MSPSS).
Cheung, 2014(29): Study 3	Single day of pre-disaster PFA training	110 disaster responders: 51 had PFA training and 59 had no PFA training. Major maritime vessel collision, Hong Kong	Cross-sectional design, 2-month follow-up	Same outcome variables and measures were used as above. The PFA group reported greater levels of self-efficacy, PFA knowledge, coping, resilience, life satisfaction, and social support compared to the control group. There were no other outcomes differences.
Reed, 2013(30)	8-hour community-based PFA training	21 emergency medical first responders received the intervention, unspecified controls. Local disasters, South Dakota, USA	RCT design, unspecified follow-up	Greater perceived PFA knowledge (knowledge of PFA questionnaire) predicted greater resilience (CD-RISC). Self-stigma (SSOSH) decreased from pre to post-PFA training.
Eye movement desensitization and reprocessing (EMDR)				
Jarero and Uribe, 2012(31)	Single individual session of EMDR-PRECI, lasting 1.5-2 hours	32 forensic personnel with moderate or severe post-traumatic stress: 18 in immediate group (severe scores), 14 in waitlist group (moderate scores). Human massacre disaster in Durango, Mexico	Quasi-experimental design, post-treatment and 3 and 5-month follow-ups	Significant improvement found in both PTSD measures (IES-R, SPRINT) at post-treatment and a further significant reduction at follow-ups, for both the immediate and waitlist/delayed treatment groups.
Jarero et al, 2013(32)	Two 1.5-hour individual sessions of EMDR-PROPARA	39 first responders in active duty: 19 received intervention, 20 received supportive counselling. Various local disasters, Sonara, Mexico	RCT design, post-treatment and 1 and 3-month follow-ups	Significant improvement in PTSD symptoms (SPRINT) at post-treatment and both follow-ups, compared to the control group.
Anticipate, plan, and deter (APD) responder risk and resilience model				
Schreiber et al, 2019(33)	The full APD Responder Risk and Resilience Model	45 US Ebola medical providers trained in APD, across two groups that were deployed to West Africa at different times	Cross-sectional design, over a 2 month period	PsySTART-R psychological risk factor trends identified and targeted with the 'deter' phase. The first deployed group showed greater cumulative risk factors than the second group after qualitative feedback implemented (10% vs 1% respectively). Good usability reported.

Resilience at work (RAW) mindfulness program				
Joyce et al, 2019(34)	6-session RAW program, lasting up to 120 min across 3.5-6 weeks	143 active full-time firefighters across 24 Primary Rescue and Hazmat stations, 60 in treatment condition and 83 in the control condition, in NSW, Australia	Cluster RCT design, post-intervention and 6-month follow-up	Psychological resilience (CD-RISC) and active coping (Brief-COPE) improved at follow-up for the intervention group compared to controls. However, bounce-back resilience (BRS), mindfulness (FMI), self-compassion (SCS-SF), cognitive fusion (CFQ), and experiential avoidance (AAQ-II) showed no difference between groups. Optimism (LOT-R), using emotional support (Brief-COPE), and using instrumental support (Brief-COPE) improved at post-intervention for intervention group compared to controls, but not at follow-up.
Resilience and coping for the healthcare community (RCHC)				
Powell and Yuma-Guerrero, 2016(35)	3-hour RCHC program	69 healthcare or social service workers across 6 health, social service, and disaster response organizations	Quasi-experimental, post-intervention and 3-week follow-up	Perceived knowledge on four domains (7 questions) increased and acute stress levels (SACL) decreased from pre to post-intervention. Perceived knowledge and social support (Social Provisions Scale) increased at follow-up. No other outcomes showed significant differences (PSS, ProQOL, Ways of Coping, CSE).
Trauma risk management (TRiM)				
Frappell-Cooke et al, 2010(36)	Evaluation of existing TRiM program	Compared two groups: 86 British army personnel in initial stages of using TRiM and 94 British Royal Marines personnel with extensive use of TRiM, deployed in Afghanistan	Quasi-experimental, outcomes measured halfway during deployment and in the week after returning home	Better general mental health (GHQ-12) and decreased PTSD symptoms (PCL-C) at post-deployment than pre and during deployment, especially for group with extensive use of TRiM.
Greenberg et al, 2010(37)	Evaluation of existing TRiM program	638 British military personnel: 6 Royal Navy warships for intervention condition and 597 personnel in 6 ships for control condition. Exposure to various natural disasters and injuries, UK	Cluster RCT design, 12-18 month follow-up	No significant difference found between groups for general psychopathology (GHQ-12), PTSD symptoms (PCL-C), or self-stigma (internal and external questions). However, history of minor disciplinary offense rates were significantly lower in the intervention group, suggesting better occupational functioning.
Watson and Andrews, 2018(38)	Evaluation of existing TRiM program	693 police officers across 3 forces using TRiM, 166 police officers across 2 forces not using TRiM. Various local disasters, UK	Cross-sectional design, unspecified follow-up	The TRiM forces reported lower levels of PTSD symptoms (PCL-C), fewer barriers to help-seeking (Stigma and Barriers to Care Questionnaire), and reduced public stigma (MSS), than the non-TRiM forces.
Hunt et al, 2013(39)	TRiM program	640 police officers: 44 given briefing, 44 given briefing and 1:1, 166 given 1:1, and 386 given no intervention. Exposure to mass shooting event in Cumbria, UK	Cross-sectional design, 2-month follow-up	The TRiM intervention program showed reduced occupation impact (absenteeism rates) when sociodemographic factors were adjusted, especially for junior officers. TRiM scores improved across time in the intervention group, although were significantly higher in the intervention group than control group at baseline and follow-up.

RCT = Randomized Controlled Trial; GHQ-28 =General Health Questionnaire-12; DASS-21 = Depression, Anxiety and Stress Scales – Short Form; IES-R = Impact of Event Scale – Revised; CD-RISC = Connor-Davidson Resilience Scale; MSPSS = Multidimensional Scale of Perceived Social Support; SSOSH = Self-Stigma of Seeking Help; EMDR-PRECI = EMDR Protocol for Recent Critical Incidents; PTSD = Post-Traumatic Stress Disorder; SPRINT = Short Post-Traumatic Stress Disorder Rating Interview; EMDR-PROPARA = EMDR Protocol for Paraprofessional Use; Brief-COPE = Brief-Coping Orientation to Problems Experienced; BRS = Bounce-Back to Resilience Scale; FMI = Freiburg Mindfulness Inventory; SCS-SF = Self-Compassion Scale – Short Form; CFQ = Cognitive Fusion Questionnaire; AAQ-II = Acceptance and Action Questionnaire; LOT-R = Life Orientation Test – Revised; SACL = Stress Arousal Checklist; PSS = Perceived Stress Scale; ProQOL = Professional Quality of Life; CSE = Coping Self-Efficacy Scale; PCL-C = PTSD Checklist-Civilian; MSS = Military Stigma Scale.

Summary of Study Characteristics

Six psychological intervention programs were identified. The included programs were tested in frontline responder populations of medical and paramedic workers, firefighters, military forces, police officers, forensic workers, and other non-professionals trained to respond to emergency or disaster situations (see Table 1). Disaster contexts included Ebola,(33) human massacres,(31,39) military deployment,(36) car crash fatalities,(28) maritime collisions,(29) and other various local disasters.(29,30,32,35,37,38) There were five randomized controlled trials (RCTs),(29,30,32,34,37) four cross-sectional studies,(29,33,38,39) and three quasi-experimental designs.(31,35,36) Follow-up periods ranged from one week to 18 months (where specified). Studies testing EMDR and RAW programs involved individual, person-directed interventions and the RCHC program involved a group format intervention. PFA, APD, and TRiM studies involved structural interventions across the whole organization through team training and stepped-care approaches.

The included studies used a variety of measures across the outcome domains of psychological distress (GHQ and DASS-21 for psychopathology; PSS and SACL for stress; IES-R, SPRINT, and PCL-C for PTSD; CFQ for cognitive fusion; AAQ-II for experiential avoidance) and positive psychological change (Brief-COPE, Ways of Coping, and CSE for coping; CD-RISC and BRS for resilience; LOT-R for optimism; FMI for mindfulness; SCS-FS for self-compassion; 6-item questionnaire for life satisfaction; ProQOL for quality of life). Additional outcomes included perceived stigma and barriers (MSS and internal and external stigma questionnaire for stigma; Stigma and Barriers to Care Questionnaire for barriers to help-seeking), perceived PFA knowledge (PFA knowledge questionnaire), and occupational functioning (history of minor disciplinary offence rates and absenteeism rates).

Early Psychological Intervention Programs

The following section provides a brief description of each early psychological intervention program included in this review.

Psychological first aid (PFA) is a widely used psychological program for disaster situations that provides access to emotional, social and physical support.(40) It aims to reduce short and long-term psychological effects of disasters and traumatic events through promoting adaptive functioning and coping. It also offers practical care and immediate support via empathic listening and information on psychosocial services. It is based on the concept of resilience and involves five empirically supported disaster and mass trauma intervention principles, which include promoting a sense of (a) safety, (b) calming, (c) self- and community-efficacy, (d) connectedness, and (e) hope.(40) It has eight core helping actions and goals that are described in Table 2.(41) It is a structural intervention, given that it requires organization training in PFA.

Eye movement desensitization and reprocessing (EMDR) is a psychotherapy treatment designed to alleviate PTSD and other trauma-related symptoms.(42) EMDR was developed based on the theoretical framework of Adaptive Information Processing (AIP), which assumes that trauma symptoms arise from adverse life events being inadequately processed within the brain and stored as traumatic memories that continue to resurface.(43) In this intervention, a trained EMDR practitioner guides the person to relive their original trauma memory in brief doses whilst making rapid eye movements, instead of the memory being locked in the nervous system in the form of thoughts, emotions, and sensory information about the episode.(44) EMDR has sub-protocols for early intervention in the immediate days and weeks following disaster events, such as the protocol for recent critical incidents (PRECI),(45) group traumatic episode protocol (G-TEP),(46) and recent traumatic episode protocol (R-TEP).(47) Individual and group formats are available for this person-directed intervention.

Anticipate, plan, and deter (APD) responder risk and resilience model aims to assess and manage psychological risk and resilience in healthcare workers and their families across pre-incident, response, and recovery stages of public health emergencies.(33) Specifically, the APD model consists of a three-step action plan, with the 'anticipate' phase involving pre-event stress inoculation training to prepare healthcare personnel for the psychosocial impact of mass trauma events. In the 'plan' phase, staff develop a personal resilience plan, where they can identify and document their expected stress responses and challenges as well as support systems and coping strategies. The final 'deter' phase involves teaching staff how and when to activate their personal resilience plan during stress exposure and encouraging them to use the Psychological Simple Triage and Rapid Treatment–Responder (PsySTART-R) self-triage system. PsySTART-R is a web-based mobile-friendly application and self-assessment tool that tracks daily exposure to traumatic stress, assesses psychological risk factors, and gives confidential feedback. Overall, the APD model is a structural intervention for the organization with individual and group components at each phase.

Resilience at work (RAW) mindfulness program, renamed recently to Mindarma, is an online intervention designed to increase resilience in high-risk workers, such as first responders.(34) The RAW is an evidence-based program that combines principles from mindfulness, cognitive-behavioural therapy (CBT), acceptance and commitment therapy (ACT), and self-compassion approaches. Specific strategies covered across the program target mindfulness, resilience, unhelpful thoughts, avoidance, personal values, self-care, and compassion. The content is delivered individually via internet format. Whilst the original program runs for 6 sessions of 20 to 25 minutes each, the revised current version is 10 sessions of 15 minutes each. There is a minimum of a 3-day break in between sessions to enable skills practice. Sessions include interactive exercises, audio-

recordings, and animations. Four half-hour group webinars delivered by a senior psychologist are available in conjunction to the program, to encourage engagement and motivation of users. Moreover, the RAW (or Mindarma) program involves individual person-directed intervention with the option of an additional group component.

Resilience and coping for the healthcare community (RCHC) is a recent post-disaster intervention designed to reduce psychological distress and increase resilience in healthcare and social service providers.(48) In particular, it aims to build healthy coping strategies for dealing with past, current, and future disasters and foster resilience through promoting support between colleagues. It combines psychoeducation and mindfulness practices in an interactive group-work format that uses solution-focused techniques and action learning theory. There are 5 core modules; common reactions to stress, how the brain reacts to severe stress and trauma, healthcare provider responses to stress and traumatic events, coping with stress and trauma with individual strategies, and coping with stress and trauma with collective strategies. RCHC is a person-directed group intervention.

Trauma risk management (TRiM) is a well-established peer support intervention for first responders that aims to mitigate psychological risk from potentially traumatic events by identifying high risk individuals and matching them to the appropriate care.(49) Participation is voluntary and careful consideration is made regarding who it is offered to. Trained management personnel first hold a planning meeting with everyone involved in the potentially traumatic event, to better understand the incident and agree upon a tailored response. In the next stage, TRiM practitioners run basic psycho-educational briefings to cover the specific incident as well as how to manage responses. Lastly, high-risk individuals are asked to take part in a semi-structured risk assessment interview and are linked with appropriate psychological support. Essentially, TRiM is a structural intervention that provides a framework for organizations to monitor and effectively manage the psychological impact of potentially traumatic events in their employees.

Healthcare Service Evaluation Framework

The following section evaluates each program within the healthcare workforce, based on the criteria of effectiveness, content applicability, and feasibility with this population. A snapshot summary of the objective, content, endorsements, effectiveness, feasibility, and overall suitability for healthcare settings is summarized in Table 2 below.

Table 2. Snapshot summary of the six early psychological intervention programs

Intervention	Objectives	Endorsements and Effectiveness	Content	Feasibility	Suitability for HCW
PFA; Structural intervention	Promotes adaptive functioning and coping in all disaster victims by providing access to information and support	Endorsed by the WHO and APS for general crisis support; suggested by multiple studies as suitable for frontline workers	Based on 5 trauma intervention principles and 8 core actions and goals (contact/ engagement; safety/comfort, stabilization, assessment of needs, practical assistance, connection with social supports, coping strategies, linkage with appropriate services)	Deliverable by non-professionals; free guides online and training course at a cost (see Textbox)	Effectiveness: Yes* Content applicability: Yes Feasibility: Yes
EMDR; Person-directed individual or group intervention	Targets trauma-related symptoms in all trauma victims by guided reliving of trauma memory	Endorsed as a trauma intervention by the WHO, APS, and APA, amongst others; has empirical evidence for PTSD	Based on adaptive information processing (AIP) model and reprocessing of trauma memory in brain; has 8-phase treatment structure	Requires trained EMDR practitioner; several free sub-protocols online, overall manual can be purchased (see Textbox)	Effectiveness: Yes* (for PTSD) Content applicability: Yes Feasibility: Yes
APD; Structural intervention	Assesses and manages psychological risk and resilience in healthcare workers at pre/during/post stages of disaster	Evaluated in one recent study and currently undergoing evaluation in West China Hospital and Minnesota, USA during COVID-19	Involves stress inoculation training, building a personal resilience plan, and activating the plan whilst using the PsySTART-R self-triage system	Requires organization to implement and monitor; free instructor guide online (see Textbox)	Effectiveness: Some* Content applicability: Yes Feasibility: Yes
RAW; Person-directed individual intervention	Aims to target resilience in high-risk workers such as first responders	Used by several first responders teams across Eastern states of Australia (ambulance, corrective services, health); evaluated in one empirical study	Based on mindfulness and self-compassion training; involves 6 (now 10) brief individual sessions via an interactive e-learning program	Requires organization to purchase from Mindarma website (see Textbox), scaled pricing depending on number of users	Effectiveness: Some* Content applicability: Yes Feasibility: Yes
RCHC; Person-directed group intervention	Seeks to mitigate post-disaster distress and build resilience in healthcare and social service providers	Recently implemented in response to several natural disasters in the USA; one empirical study; funded by AmeriCares	Based on the risk and resilience framework; combines psycho-education, group work, and mindfulness into 5 core modules	Requires trained RCHC facilitator; free facilitator guide online (see Textbox)	Effectiveness: Some* Content applicability: Yes Feasibility: Yes
TriM; Structural intervention	Peer support intervention for first responders that identifies high risk individuals and matches them to appropriate care	Developed for the British police force and military, now recommended as peer-support initiative across UK; mixed empirical evidence, may improve occupational functioning	Based on trauma-informed care principles and involves stepped management phases	Volunteer personnel trained as TRiM practitioners (2-day course). Free handbooks for trauma victims (see Textbox), no practitioner manual online	Effectiveness: Some* Content applicability: Yes Feasibility: Yes

HCW = HealthCare Workers. WHO = World Health Organization; APS = Australian Psychological Society; APA = American Psychiatric Association. *Effectiveness classified as 'yes' if program tested in two or more studies, 'some' if one study, and 'none' if no studies.

Psychological first aid (PFA)

Effectiveness. The evidence-base for PFA is somewhat mixed. Despite being one of the most widely known and used programs in the general community(50) as well as endorsed by the World Health Organization(51) and Australian Psychological Society,(52) it has limited empirical evidence.(53) To our knowledge, there has been no empirical study in which frontline workers were the direct recipients of PFA. However, three studies reported on the mental health benefits to frontline workers after receiving PFA training (see Table 2). After a single day of training, psychological benefits were reported in medical healthcare staff(30) and other professional and non-professional first responders.(29) These benefits included improvements in positive psychological outcomes of resilience, self-efficacy, perceived knowledge, and social support. Reductions in perceived self-stigma was also found. There was no evidence for change in general psychopathology, coping, or life satisfaction in the intervention group, although controls showed increased general psychopathology over time. The authors suggest that PFA has psychological benefits for the person delivering it, in addition to their recipients, as it teaches coping strategies and facilitates connection with support systems and services, which can be used to protect the self as well as support others.

Content applicability. PFA is a generic disaster relief approach that can be implemented either during or immediately after the disaster and can apply to anyone impacted by the event. Its broad spectrum response strategy makes it easily generalizable to multiple population groups and settings with a variety of psychological needs. It allows for local adaptations, thus is suitable for healthcare workers.

Feasibility. PFA training typically runs for a single day. Specialized mental health practitioners are not required to deliver PFA, although it assumes that trainees have basic knowledge in helping someone with distress. Short training courses in delivering PFA are available to people wishing to assist others after a traumatic event. Costs are variable, but can be minimized through group training, train the trainee schemes, and online training (see Textbox).

Eye movement desensitization and reprocessing (EMDR)

Effectiveness. Despite continuous skepticism from the scientific community,(54) EMDR is steadily becoming a popular and well-established intervention for treating trauma-related symptoms.(55) It is universally endorsed by the World Health Organization,(56) amongst others.(26,57,58) Reduced PTSD symptoms have been found across forensic personnel and first responders receiving EMDR intervention.(31,32) Given these findings and that disaster workers across healthcare, forensic, and first responder populations are frequently exposed to traumatic events and are prone to experience

secondary traumatization,(4) EMDR may also be an applicable intervention for reducing trauma-related symptoms in healthcare providers.

Content applicability. The Protocol for Paraprofessional use in acute trauma situations (PROPARA) was developed as an early EMDR intervention for first responders.(32) Like other early intervention models, it follows the same eight-phase structure as the standard treatment protocol,(59,60) yet differs in the specific processing techniques used and how the traumatic episode is conceptualized.[29,40] PROPARA would need no further adaption for use with healthcare workers who experience trauma or disaster events. Other early EMDR interventions may also be easily adapted to suit the support needs of the healthcare workforce.

Feasibility. Early EMDR intervention typically runs for a couple of hours, whereas the standard intervention spreads across several days. An EMDR practitioner with specialist training must deliver EMDR therapy to ensure correct delivery, making it a costly treatment. There are several early EMDR intervention protocols available online.

Anticipate, plan, and deter (APD) responder risk and resilience model

Effectiveness. There is limited evaluation of the APD model in the literature. In one recent study, however, the full APD model was implemented in medical healthcare providers during the Ebola crisis, who showed reduced psychological risk factors across time.(33) The APD model is part of a two-stage psychological rehabilitation plan currently underway in West China Hospital, which seeks to prevent further psychological impact of COVID-19 on healthcare workers. The APD model is also part of a larger psychological intervention study for healthcare organizations to provide to their staff during the COVID-19 pandemic, currently undergoing evaluation in Minnesota.(61) Whilst research on the APD model is in its infancy, it has shown promising effectiveness in healthcare workers.

Content applicability. The APD model was explicitly intended as a psychological intervention for healthcare workers, with theoretical frameworks of risk and resilience tailored to suit this population. Therefore, its content is already applicable to healthcare settings.

Feasibility. The APD risk and resilience model requires the organization to implement the system throughout all stages of disaster response and regularly monitor risk. Therefore, it is relatively resource intensive compared to other programs, as it would need to be continuously managed over time. See Textbox for a full instructor guide.

Resilience at work (RAW) mindfulness program

Effectiveness. The RAW program shows good preliminary results, with a recent empirical study finding improved positive mental health outcomes of resilience and active coping in a group of full-

time firefighters after completion of the program.(34) This study also showed some evidence for increased optimism and use of support, but no evidence for change in bounce-back resilience mindfulness, self-compassion, cognitive fusion, or experiential avoidance. The program, now called Mindarma and adapted to run for 10 sessions, has been adopted by several frontline organizations in the Eastern states of Australia including ambulance, corrective, and health services. The program is also fully endorsed by the Black Dog Institute, a not-for-profit organization and world leader in the provision of services and research for mental health.

Content applicability. The RAW program was designed to protect the well-being of high-risk workers through resilience training. The program can be tailored to the unique needs of the applicable workforce, through customization of content such as scripts, animations, and programming. Therefore, it appears suitable for healthcare professionals in high-risk workplaces.

Feasibility. The online RAW (or Mindarma) program can be implemented quickly and easily at a low cost by contacting the owners of the program via their website (see Textbox). Pricing is scaled depending on the number of users in the organization and leaders or managers can receive face-to-face training workshops to ensure they are well-informed.

Resilience and coping for the healthcare community (RCHC)

Effectiveness. The RCHC intervention has demonstrated some effectiveness at reducing psychological impact in healthcare workers, producing positive psychological outcomes of increased perceived knowledge and social support and decreased acute stress levels in a single study.(35) RCHC was recently implemented in several other areas also affected by natural disasters in the USA, such as typhoon-affected Saipan in 2015 and flood-affected Shreveport in 2017, and is currently undergoing evaluation as a recovery response strategy for Hurricane Harvey in Texas and Hurricane Maria in Puerto Rico, funded by AmeriCares.(48)

Content applicability. The RCHC uses a risk and resilience framework that has been carefully adapted for use with healthcare and social service providers by acknowledging the high-risk exposure of this workforce and the incorporation of appropriate strategies to build resilience.(48) Therefore, RCHC contains suitable content as it was explicitly designed for the healthcare workforce.

Feasibility. The RCHC can be delivered to staff in three hours and a trained RCHC facilitator is required to deliver the intervention. There is no full manual available online (see Textbox).

Trauma risk management (TRiM)

Effectiveness. The TRiM program has had mixed findings regarding its psychological impact in police officers and the military.(36–38,62) However, there is evidence to suggest it can reduce stigma and

barriers to help-seeking as well as improve occupational functioning in these populations.(37–39) The overlap in traumatic workplace experiences between healthcare and other frontline workers suggests that the TRiM program would show similar results in healthcare settings.

Content applicability. Initially developed in the British military and used within police officers, TRiM is now used by many different organizations across the UK. It offers an evidence-based framework for early indication of who may go on to develop mental health symptoms after a traumatic event and how this should be managed to ensure the best conditions for psychological recovery. This framework is generic enough that it is also suitable for use in healthcare settings.

Feasibility. The TRiM program is intended to be delivered by volunteer personnel within the organization, ideally from a managerial position. TRiM practitioner courses typically run over two or more days. Several TRiM handbooks designed for trauma victims are available online (see Textbox).

DISCUSSION

The key objective of this paper was to equip healthcare service providers with practical information on how to protect the mental health of healthcare professionals during local and global disasters. Since the evidence-base for early psychological interventions within healthcare workers is limited and other frontline personnel face exposure to traumatic events, all disaster responders were considered in this review. Evidence was searched for early psychological interventions designed to prevent or reduce psychological harm and that were tested in frontline workers during recent disease outbreaks and disasters. Each included program was described and evaluated for its suitability for rapid implementation among the healthcare workforce using the criteria of effectiveness, content applicability, and feasibility. This evaluation framework seeks to provide a current workplace mental health response guide for healthcare service providers.

Generally, the evidence-base was limited across all intervention programs. Six early psychological programs were identified across 12 studies, comprising three person-directed interventions and three structural level interventions. Out of the sparse number of studies, PFA and EMDR were the only programs tested in frontline disaster responders across multiple studies, in addition to being applicable and feasible for rapid implementation within the healthcare workforce (see Table 2). In particular, these interventions demonstrated improved psychological outcomes at follow-ups across at least two studies each, with several positive psychological outcomes found with PFA(29,30) and reduced PTSD levels consistently found with EMDR.(31,32) Both programs are available in group format and can be delivered in a single day. However, it is important to note that the evidence-base for PFA involves frontline workers receiving training in PFA delivery rather than as direct recipients of the intervention. Furthermore, both interventions are generic approaches designed to prevent or reduce psychological impact in any disaster or trauma victims.

The APD, RAW (or Mindarma), and RCHC programs are relatively new psychological interventions that have shown promising outcomes with frontline disaster workers and appear to be potentially suitable interventions for rapid implementation among healthcare workers.(33–35) APD and RCHC were specifically intended for healthcare workers and RAW for high-risk workers, thus these programs have been tailored to suit this population and may be more appropriate than more generic approaches such as PFA and EMDR. Nevertheless, evidence for the APD, RCHC, and RAW programs is limited to a single study each and only the RAW study included a control condition, thus further evaluation of these programs is required in order to strengthen their evidence-base. TRiM also requires further research, due to inconsistent findings of effectiveness across various studies with frontline responders.(62)

Several promising early psychological interventions did not meet eligibility requirements for this review but deserve mention. Firstly, immediate cognitive-functional PFA (ICF-PFA) was recently proposed as an improved, structured, and more immediate disaster relief approach to PFA that targets symptoms of the acute stress reaction by drawing on psychological theories of stress and resilience.(28) It is recognized as the national PFA model by the Israeli Ministry of Health and has been adopted by several frontline sectors, with the Israeli Defence Forces currently investigating the impact of ICF-PFA training in frontline soldiers. However, this intervention was excluded as it has only been empirically tested in trauma-exposed adolescent students and requires formal evaluation in frontline staff. In addition, a computer-assisted resilience training program given to Canadian healthcare workers during the SARS outbreak found positive psychological impact at post-treatment, but was not included in this review due to lack of a follow-up measurement.(63) A recent digital learning package targeting psychological well-being showed good user satisfaction of healthcare workers across the UK during COVID-19 but was also excluded as it used qualitative analysis only.(64) A study testing a stress management and resilience training program in medical physicians was also excluded due to absence of disaster situations.(65) Finally, study protocol is available for an 8-week online CBT program designed for healthcare workers that is currently undergoing evaluation in the context of COVID-19 in France.(66) Future research should explore these potential alternative interventions, in addition to the ones included in this review.

Empirical research on the effectiveness of early psychological interventions for preventing or reducing post-traumatic and other mental health symptoms in healthcare and other frontline workers is limited, with few RCTs available and most interventions targeting community disaster victims. One alternative is to compare the findings of this paper with literature on early psychological interventions tested in other trauma-exposed populations. Recent systematic reviews suggest that early EMDR and trauma-focused CBT are amongst the most effective individualized programs for targeting trauma-related symptoms,(67,68) yet more evidence is still needed on these interventions.(69) PFA is also recommended as an early intervention for trauma victims,(50) despite its lack of evidence in comparison to the other interventions.(53) This wider literature is consistent with the finding that PFA and EMDR are the most evidence-based early psychological interventions for frontline disaster workers to date. To the best of our knowledge, there is currently no research on trauma-focused CBT for frontline responder populations. Nevertheless, it is recommended that anyone with severe or persistent trauma-related symptoms should seek out more intensive and longer-term individualized support, such as trauma-focused CBT.(11,17,18)

It is possible that several other suitable early psychological interventions exist for frontline disaster workers, in addition to the ones mentioned above, that have not yet received formal evaluation.

However, the limited nature of this research is understandable given the chaotic nature of healthcare services when dealing with mass traumas and disasters. A potential limitation of this paper is that, due to the rapid need for a review in this area, only three databases were searched and a single reviewer assessed the articles. Even though the databases were chosen for their comprehensive coverage of medical and psychological research, it is possible that relevant studies were missed. Additionally, the ongoing character of the COVID-19 pandemic may induce longer periods of elevated traumatic stress in frontline workers compared to the acute trauma from local disasters and accidents, differentiating this context from previous disaster situations. Despite limitations, available past research with all frontline workers can still guide healthcare services in implementing early intervention programs that might proactively address the mental health fallout of the current COVID-19 crisis, as well as future pandemics and other mass health and trauma crises. This review has outlined several early interventions tested in frontline workers during disease outbreaks and other disasters, which also appear suitable for widespread implementation in the healthcare workforce.

Whilst the process and prioritization of research can be challenging in the context of mass trauma events, this is an essential area of development. Healthcare systems play a crucial role in evaluating the interventions they implement, in order to build the much needed evidence-base for preventing and reducing psychological impact in healthcare workers and elucidating best practices for services in managing future disasters. Healthcare services are typically vigilant to addressing the physical safety of staff in the workplace and the psychological safety of staff must also be given equal priority. Indeed, healthcare services have a duty of care to equip their staff with support and psychological skills to assist with the mental health challenges they will inevitably face as part of their courageous frontline work they do for the benefit of the broader community, particularly during times of mass crises. This review of the evidence for early psychological interventions within frontline staff and the consideration of suitability for healthcare settings is intended to be a helpful resource to guide healthcare and other frontline services seeking to select an intervention to suit the needs of their organization and its employees.

Figure 1. Study flow diagram.

Textbox. **Links to more information on each included program.**

Psychological first aid (PFA)

- There are several free PFA guides available online. The World Health Organization(51) provides a guide in 30 languages, accessible via the link: https://www.who.int/mental_health/publications/guide_field_workers/en/
- The Australian Red Cross provides another PFA guide endorsed by the Australian Psychological Society,(52) accessible via the link: https://www.redcross.org.au/getmedia/dc21542f-16e4-44ba-8e3a-4f6b907bba6f/Psychological-First-Aid-An-Australian-Guide-04-20.pdf.aspx

Eye movement desensitization and reprocessing (EMDR)

- A comprehensive practice manual by Marilyn Luber(70) can be purchased online that contains models, scripted protocols, and summary sheets for early EMDR intervention.
- An overview and protocol manual is available for free for EMDR R-TEP(47): https://emdrresearchfoundation.org/toolkit/rtep-manual.pdf; for EMDR-PRECI(71): https://emdrresearchfoundation.org/toolkit/preci.pdf; and for EMDR G-TEP(72): https://emdrresearchfoundation.org/toolkit/gtep.pdf

The anticipate, plan, and deter (APD) responder risk and resilience model

- An instructor guide for the APD model with relevant worksheets(73) is freely available online: http://file.lacounty.gov/SDSInter/dhs/221064_AnticipatePlanandDeterInstructorManual-FINAL.pdf

Resilience at work (RAW) mindfulness program

- The RAW (now called Mindarma) program can be purchased via the website below(74), which contains information including pricing, media, workshops, and contact details: https://www.mindarma.com/home/
- More information can also be found on the Black Dog Institute website(75): https://www.blackdoginstitute.org.au/education-services/workplaces/workplace-programs/mindarma/

Resilience and coping for the healthcare community (RCHC)

- Whilst the full RCHC manual is not available online, the author can be contacted at: paula.yuma@colostate.edu and more information on each module(48) can be found at: https://digitalcommons.library.tmc.edu/jfs/vol19/iss1/8

Trauma Risk Management (TRiM)

- Several TRiM handbooks designed for trauma victims are available online. For more information on TRiM training, see(76): http://www.marchonstress.com/page/p/trim_faqs
- TRiM handbook by the British Royal Navy(77): http://c69011.r11.cf3.rackcdn.com/d951c5627eb44b3789e84292d1e2c1fa-0x0.pdf
- TRiM handbook by the UK Hampshire Fire and Rescue Service and Hampshire Constabulary(78): https://documents.hants.gov.uk/corprhantsweb/Traumahandbook.pdf

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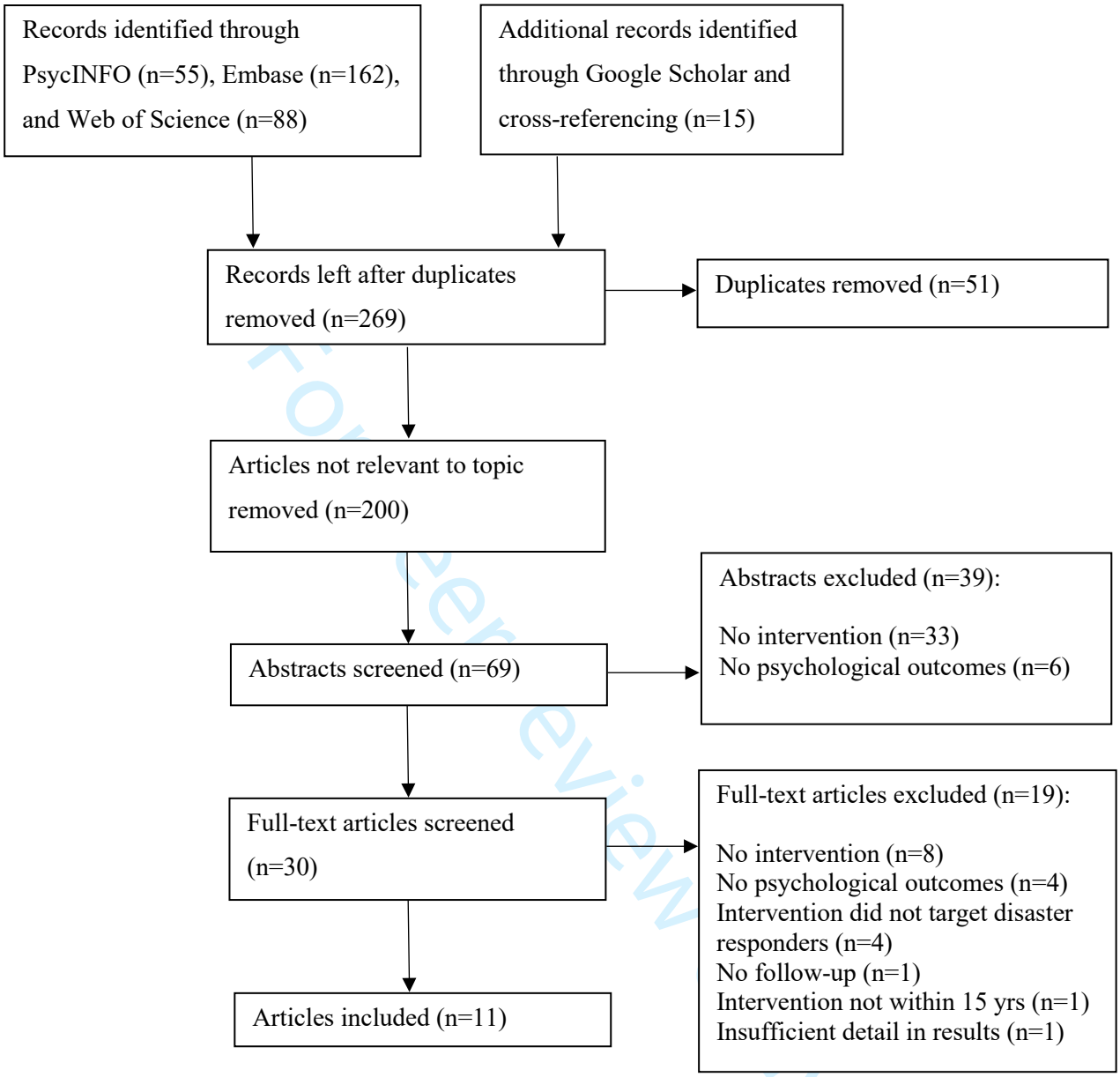

Reporting checklist for systematic review and meta-analysis.

Based on the PRISMA guidelines.

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Complete this checklist by entering the page numbers from your manuscript where readers will find each of the items listed below.

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		Reporting Item	Page Number
Title			
	#1	Identify the report as a systematic review, meta-analysis, or both.	1
Abstract			

Structured summary	#2	Provide a structured summary including, as applicable: background; objectives; data sources; study eligibility criteria, participants, and interventions; study appraisal and synthesis methods; results; limitations; conclusions and implications of key findings; systematic review registration number	2
Introduction			
Rationale	#3	Describe the rationale for the review in the context of what is already known.	4
Objectives	#4	Provide an explicit statement of questions being addressed with reference to participants, interventions, comparisons, outcomes, and study design (PICOS).	5
Methods			
Protocol and registration	#5	Indicate if a review protocol exists, if and where it can be accessed (e.g., Web address) and, if available, provide registration information including the registration number.	5
Eligibility criteria	#6	Specify study characteristics (e.g., PICOS, length of follow-up) and report characteristics (e.g., years considered, language, publication status) used as criteria for eligibility, giving rational	6
Information sources	#7	Describe all information sources in the search (e.g., databases with dates of coverage, contact with study authors to identify additional studies) and date last searched.	5

Search	#8	Present full electronic search strategy for at least one database, including any limits used, such that it could be repeated.	6
Study selection	#9	State the process for selecting studies (i.e., for screening, for determining eligibility, for inclusion in the systematic review, and, if applicable, for inclusion in the meta-analysis).	6
Data collection process	#10	Describe the method of data extraction from reports (e.g., piloted forms, independently by two reviewers) and any processes for obtaining and confirming data from investigators.	5,6
Data items	#11	List and define all variables for which data were sought (e.g., PICOS, funding sources), and any assumptions and simplifications made.	5,6
Risk of bias in individual studies	#12	Describe methods used for assessing risk of bias in individual studies (including specification of whether this was done at the study or outcome level, or both), and how this information is to be used in any data synthesis.	6
Summary measures	#13	State the principal summary measures (e.g., risk ratio, difference in means).	6
Planned methods of analysis	#14	Describe the methods of handling data and combining results of studies, if done, including measures of consistency (e.g., I2) for each meta-analysis.	5

Risk of bias across studies	#15	Specify any assessment of risk of bias that may affect the cumulative evidence (e.g., publication bias, selective reporting within studies).	6
Additional analyses	#16	Describe methods of additional analyses (e.g., sensitivity or subgroup analyses, meta-regression), if done, indicating which were pre-specified.	5
Results			
Study selection	#17	Give numbers of studies screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally with a flow diagram.	6,7
Study characteristics	#18	For each study, present characteristics for which data were extracted (e.g., study size, PICOS, follow-up period) and provide the citation.	8,9
Risk of bias within studies	#19	Present data on risk of bias of each study and, if available, any outcome-level assessment (see Item 12).	7
Results of individual studies	#20	For all outcomes considered (benefits and harms), present, for each study: (a) simple summary data for each intervention group and (b) effect estimates and confidence intervals, ideally with a forest plot.	8,9
Synthesis of results	#21	Present the main results of the review. If meta-analyses are done, include for each, confidence intervals and measures of consistency.	13

Risk of bias across studies	#22	Present results of any assessment of risk of bias across studies (see Item 15).	7
Additional analysis	#23	Give results of additional analyses, if done (e.g., sensitivity or subgroup analyses, meta-regression [see Item 16]).	8,9
Discussion			
Summary of Evidence	#24	Summarize the main findings, including the strength of evidence for each main outcome; consider their relevance to key groups (e.g., health care providers, users, and policy makers	19
Limitations	#25	Discuss limitations at study and outcome level (e.g., risk of bias), and at review level (e.g., incomplete retrieval of identified research, reporting bias).	20
Conclusions	#26	Provide a general interpretation of the results in the context of other evidence, and implications for future research.	20
Funding			
Funding	#27	Describe sources of funding or other support (e.g., supply of data) for the systematic review; role of funders for the systematic review.	21

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Addressing the psychological impact of COVID-19 on healthcare workers: Learning from a systematic review of early interventions for frontline disaster responders

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Addressing the psychological impact of COVID-19 on healthcare workers: Learning from a systematic review of early interventions for frontline responders

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ABSTRACT

Objectives: Protecting healthcare workers from psychological harm is an urgent clinical issue within the current COVID-19 pandemic. Research on early psychological programs that aim to prevent or reduce mental health symptoms and that have been tested in frontline responders may assist service providers with choosing a suitable intervention for rapid dissemination in healthcare settings.

Design and outcome measures: First, Embase, Web of Science, PsycINFO, and Google Scholar were searched through a systematic literature review of early psychological interventions administered to frontline responders in the last 15 years. Interventions were included if they were designed to prevent or reduce psychological impact and had outcome measures of psychological distress (e.g. general psychopathology, PTSD, and stress) and/or positive mental health domains (e.g. resilience, self-efficacy, and life satisfaction). Second, the suitability of these programs for the healthcare workforce was evaluated according to the criteria of effectiveness, content applicability, and feasibility.

Results: Of 320 articles retrieved, 12 relevant studies were included that described six early psychological interventions. Although the evidence-base is limited, Psychological First Aid (PFA), Eye Movement Desensitization and Reprocessing (EMDR), and Trauma Risk Management (TRiM) showed effectiveness across at least two studies each with frontline workers. Resilience and Coping for the Healthcare Community (RCHC), Anticipate, Plan, and Deter (APD), and Resilience at Work (RAW) programs found promising results in single studies. Concerning other suitability criteria, all programs appear applicable to healthcare settings and have acceptable feasibility for rapid implementation.

Conclusions: Despite the limited evidence, several interventions were identified as potentially suitable and useful for improving psychological functioning of healthcare workers across a variety of disaster situations. Service providers should continue to implement and evaluate early psychological interventions in frontline workers in order to refine best practices for managing the psychological impact of future disasters.

Abstract word count: 291

Strengths and Limitations:

- This is a timely review given the current COVID-19 crisis and the limited availability of evidence-based information on early psychological interventions for healthcare workers and other frontline responders.
- Practical suitability of each program was carefully considered, to address the need for rapid and widespread implementation of psychological support in the healthcare workforce.
- Despite multiple databases searched and a rigorous review process, it is possible that there are other suitable programs not identified by this review paper.
- Given the chaotic nature of healthcare services when dealing with mass trauma or disasters, there may also be existing programs that have not yet received formal evaluation.

INTRODUCTION

Healthcare decision-makers are continually seeking information on how to provide the best psychological assistance to workers. In particular, working in the frontline during local and global disasters involves repeated exposure to traumatic events, which can have a major impact on mental health such as increased rates of acute stress disorder, post-traumatic stress disorder (PTSD), anxiety, and depression.(1,2) Continued psychological distress may lead to further adverse outcomes of substance abuse and suicide risk(3) as well as burnout, compassion fatigue, and secondary traumatization.(4,5) In contrast, positive mental health domains such as resilience may serve to protect the mental health of frontline responders.(6) In many cases, psychological harm may have a delayed-onset, with symptoms only developing several months or years after the traumatic event.(7) It is therefore important for healthcare services to implement effective early intervention measures that seek to mitigate ongoing psychological distress and minimize the development of post-traumatic symptoms in the workforce.(8) However, organizations require evidence-based information about available psychological programs before they can make well-informed decisions on how to assist the mental health needs of their staff. By reviewing this information, the current study seeks to guide the response of healthcare service providers during current and future disasters.

The novel severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) or COVID-19 pandemic (9) has led to a sharp increase in demand for frontline health and social care workers such as nurses, doctors, paramedics, and forensic workers as well as other security personnel including police officers and the military.(10) This increased demand occurred in the context of chronic shortages in frontline staff due to quarantine restrictions, sick leave, and the need for staff to continue caring for dependents and attend to other family responsibilities.(11) As a result, these frontline responders have elevated workloads and are expected to work long hours under highly stressful conditions. COVID-19 has brought further workplace stressors to healthcare workers due to fears of contracting the virus and infecting others, difficulties accessing personal protective equipment, stigma, discrimination from the public, and heightened emotional burden.(12) These stressors have triggered elevated rates of psychological distress in healthcare workers such as depression, anxiety, and PTSD(13,14) and may indeed have secondary effects such as burnout and compassion fatigue, creating concern over a subsequent mental health crisis.(15)

Healthcare services have responded swiftly to mental health concerns in the workforce. Initial assistance has included organization-wide provision of non-psychological practical help through infection control procedures, access to protection equipment, and response to other basic physical

needs.(16) There is also a wealth of ad-hoc stress management instructions available online to healthcare workers during COVID-19, which provide lists of basic educational information about psychological self-care and help-seeking. Staff are encouraged to contact personal crisis helplines and professional support services if mental health symptoms persist, with cognitive-behavioural therapy (CBT) interventions (e.g. trauma-focused CBT) endorsed as an effective long-term treatment option for the reduction of ongoing psychological symptoms.(11,17,18) However, such individualized interventions carry inherent limitations, as they require active help-seeking behaviour and stigma regarding mental health has been identified as a substantial barrier to seeking psychological support amongst healthcare workers.(19)

The provision of early psychological interventions to all trauma-exposed individuals may be equally as important for preventing and minimizing the short and long-term negative impacts of traumatic events on mental health as delayed intervention after symptom onset.(20) Recent research has recommended that frontline responders should receive early psychological intervention within the first few months of the traumatic event.(21,22) However, there is currently no consistent implementation of early psychological interventions amongst trauma-exposed workforces. One major barrier to implementation is the lack of accessible information regarding early psychological interventions suitable for frontline workers. Furthermore, there is a paucity of research that has tested the effectiveness of these early interventions specifically within healthcare providers. Despite obvious differences in job demands across various frontline services and disaster situations, these workers all face frequent trauma exposure within the workplace.(4,5) A potential solution to this issue is therefore to examine psychological programs that have been administered and tested in *all* frontline responders during previous disasters and pandemics and review whether these programs are relevant and practical for rapid implementation within healthcare services. The key objective of this paper was therefore to provide evidence-based and practical information to assist healthcare service providers in deciding how best to protect the mental health of their staff, drawing on research from various frontline workforces.

Specifically, this review aimed to (i) identify and summarize recent early psychological intervention programs that were administered to prevent or minimize psychological harm in frontline responders, through a systematic review; and (ii) assess the potential suitability of implementing these interventions within the healthcare workforce using a healthcare service evaluation framework.

METHODOLOGY

Our methodology involved (i) a systematic review of early psychological intervention programs tested in frontline responders; and (ii) a healthcare service evaluation framework that reviewed the suitability of each program for widespread implementation across healthcare workers based on the criteria of effectiveness, content applicability, and feasibility of delivery.(23) Frontline workers are defined here as individuals trained to provide services in emergency or disaster settings, such as healthcare workers and security forces. Early psychological interventions are defined here as programs designed to prevent or reduce mental health impact with delivery commencing within three months of exposure to a traumatic event, following recently revised guidelines from the International Society for Traumatic Stress Studies (ISTSS).(24) According to the recent ISTSS guidelines, interventions were further classified as universal with single or multiple prevention sessions, selective/indicated with single or multiple prevention sessions, or early treatment with single or multiple treatment sessions. Universal interventions target all trauma-exposed individuals regardless of risk, selective/indicated interventions target individuals at risk of developing symptoms or with early signs of symptoms, and early treatment interventions target individuals after the development of a disorder.(24)

Systematic Review

For the systematic review, a single reviewer searched for early psychological intervention programs that aim to prevent or reduce mental health issues and that have been tested in frontline responders. The single reviewer examined the identified records twice to minimize error and a second author reviewed the final articles. The search and reporting strategy followed PRISMA guidelines(25) and was conducted in July 2020 across Embase, Web of Science, PsycINFO, Google Scholar, and cross-referencing of reference lists. Using the appropriate search term strategy for each database, the Ovid searches included the following keywords:

(Health care worker* OR healthcare worker* OR health care staff OR healthcare staff OR medical staff OR medical worker* OR frontline worker* OR frontline staff) AND (mental health OR psychological impact OR PTSD OR post-traumatic stress* OR anxiety OR depression) AND (prevent* OR intervention*) AND (covid-19 OR coronavirus OR outbreak* OR epidemic* OR pandemic* OR disaster).

The terms were used as free text words. Articles were first screened for relevance to the topic by their title and abstract and if they appeared suitable then the full text was downloaded (see Figure 1). Risk of bias was assessed at the review process and study levels, according to ROBIS

guidelines.(26) Studies were summarized based on their tested population, disaster context, study design, follow-up, and outcome measures.

Eligibility Criteria

- Early psychological interventions with delivery commencing within three months of the traumatic event, including universal, selective/indicated, or early treatment interventions according to the classification system previously outlined
- Intervention tested in frontline responders
- Empirical studies and doctoral theses with a clear theoretical framework that is based on psychological theory
- Psychological outcome measurements of positive mental health outcomes such as resilience, coping, and life satisfaction and/or negative mental health outcomes such as PTSD, depression, and anxiety
- Longitudinal research design with a baseline and post-treatment follow-up(s)
- Published within the last 15 years

In contrast, non-psychological (e.g. medical, drug, and physical) interventions, non-English studies, and purely descriptive, qualitative, or case study designs were excluded. Finally, studies were excluded if the proposed intervention program is explicitly recommended against by clinical practice guidelines, such as psychological debriefing.(27,28)

Healthcare Service Evaluation Framework

After intervention programs were identified through the systematic review, they were rated on their suitability for implementation within healthcare workplaces, based on criteria adapted from an evaluation framework for healthcare programs.(23) Each program was evaluated using three core components of; (i) effectiveness, in this case for reducing psychological distress outcomes or increasing positive psychological outcomes; (ii) content applicability to healthcare settings, to determine whether the theoretical content and program components are relevant for healthcare workers; and (iii) feasibility of implementation, including ease of delivery, accessibility, and cost.

Patient and Public Involvement

There was no patient or public involvement due to the nature of the review.

Ethics Statement and Informed Consent

Ethics approval was not required as the methodology comprised a literature review and there was no testing of participants. Informed consent was not applicable.

RESULTS

Study selection

The search strategy in the systematic literature review identified 320 potentially relevant articles, including 305 within the databases of PsycINFO, Embase, and Web of Science, and an additional 15 articles through manually searching Google Scholar and cross-referencing of reference lists (Figure 1). After duplicates were removed and titles and abstracts were screened for relevance, 30 full-texts of articles were downloaded. Nineteen studies were excluded in the full-text screening stage. Finally, a total of 12 studies were identified (11 articles, indicated by * in the reference list; see Table 1). Risk of bias was assessed in the review process and the only risk identified was the absence of a second reviewer. Risk of bias was also assessed at the study level, which showed that the study by Farchi et al(29) did not meet eligibility criteria due to participants not being frontline responders and was therefore excluded.

----------Figure 1----------

Table 1. Evidence-base for early psychological interventions with frontline responders

Authors	Intervention	Participants and Context	Study Design	Key Findings and Outcomes
Psychological first aid (PFA)				
Cheung, 2014 (30): Study 2	Single day of group pre-disaster PFA training, universal intervention	802 frontline responders: 458 in intervention group and 460 in waitlist control group. Various local and overseas disasters and mass gathering events, Hong Kong	RCT design, 3 and 6-month follow-ups	The intervention group showed increased self-efficacy (pilot tested 13-item scale) at follow-ups, compared to controls. Paradoxically, the control group had increased general psychopathology (GHQ-28), adaptive coping (Brief-COPE), and life satisfaction (6-item scale) scores across time, whereas the intervention group remained unchanged for these measures. No other outcomes showed significant differences between groups (8-item PFA knowledge scale, DASS-21, IES-R. CD-RISC, MSPSS).
Cheung, 2014(30): Study 3	Same as above	110 frontline responders: 51 had PFA training and 59 had no PFA training. Major maritime vessel collision, Hong Kong	Cross-sectional design, 2-month follow-up	Same outcome variables and measures were used as above. The PFA group reported greater levels of self-efficacy, PFA knowledge, coping, resilience, life satisfaction, and social support compared to the control group. There were no other outcome differences.
Reed, 2013(31)	Same as above	21 emergency medical first responders received the intervention, unspecified controls. Local disasters, South Dakota, USA	RCT design, unspecified follow-up	Greater perceived PFA knowledge (knowledge of PFA questionnaire) predicted greater resilience (CD-RISC). Self-stigma (SSOSH) decreased from pre to post-PFA training.
Eye movement desensitization and reprocessing (EMDR)				
Jarero and Uribe, 2012(32)	Single 1.5-2 hr individual session of EMDR-PRECI, early treatment intervention	32 forensic personnel with moderate or severe post-traumatic stress: 18 in immediate group (severe scores), 14 in waitlist group (moderate scores). Human massacre disaster in Durango, Mexico	Quasi-experimental design, post-treatment and 3 and 5-month follow-ups	Significant improvement found in both PTSD measures (IES-R, SPRINT) at post-treatment and a further significant reduction at follow-ups, for both the immediate and waitlist/delayed treatment groups.
Jarero et al, 2013(33)	Two 1.5-hr individual sessions of EMDR-PROPARA, selective/indicated intervention	39 first responders in active duty: 19 received intervention, 20 received supportive counselling. Various local disasters, Sonara, Mexico	RCT design, post-treatment and 1 and 3-month follow-ups	Significant improvement in PTSD symptoms (SPRINT) at post-treatment and both follow-ups, compared to the control group.
Anticipate, plan, and deter (APD) responder risk and resilience model				
Schreiber et al, 2019(34)	Ongoing APD for whole organization, universal intervention	45 US Ebola medical providers trained in APD, across two groups that were deployed to West Africa at different times	Cross-sectional design, over a 2 month period	PsySTART-R psychological risk factor trends identified and targeted with the 'deter' phase. The first deployed group showed greater cumulative risk factors than the second group after qualitative feedback implemented (10% vs 1% respectively). Good usability reported.

Resilience at work (RAW) mindfulness program				
Joyce et al, 2019(35)	Six 2-hr individual sessions of RAW (across 3.5-6 weeks), universal intervention	143 active full-time firefighters across 24 Primary Rescue and Hazmat stations, 60 in treatment condition and 83 in the control condition, in NSW, Australia	Cluster RCT design, post-intervention and 6-month follow-up	Psychological resilience (CD-RISC) and active coping (Brief-COPE) improved at follow-up for the intervention group compared to controls. However, bounce-back resilience (BRS), mindfulness (FMI), self-compassion (SCS-SF), cognitive fusion (CFQ), and experiential avoidance (AAQ-II) showed no difference between groups. Optimism (LOT-R), using emotional support (Brief-COPE), and using instrumental support (Brief-COPE) improved at post-intervention for intervention group compared to controls, but not at follow-up.
Resilience and coping for the healthcare community (RCHC)				
Powell and Yuma-Guerrero, 2016(36)	Single 3-hr group session of RCHC, universal intervention	69 healthcare or social service workers across 6 health, social service, and disaster response organizations	Quasi-experimental, post-intervention and 3-week follow-up	Perceived knowledge on four domains (7 questions) increased and acute stress levels (SACL) decreased from pre to post-intervention. Perceived knowledge and social support (Social Provisions Scale) increased at follow-up. No other outcomes showed significant differences (PSS, ProQOL, Ways of Coping, CSE).
Trauma risk management (TRiM)				
Frappell-Cooke et al, 2010(37)	Stepped-care TRiM for whole organization, both universal and selective/indicated intervention	Compared two groups: 86 British army personnel in initial stages of using TRiM and 94 British Royal Marines personnel with extensive use of TRiM, deployed in Afghanistan	Quasi-experimental, outcomes measured halfway during deployment and in the week after returning home	Better general mental health (GHQ-12) and decreased PTSD symptoms (PCL-C) at post-deployment than pre and during deployment for both groups, but especially for group with extensive use of TRiM.
Greenberg et al, 2010(38)	Same as above	638 British military personnel: 6 Royal Navy warships for intervention condition and 597 personnel in 6 ships for control condition. Exposure to various natural disasters and injuries, UK	Cluster RCT design, 12-18 month follow-up	No significant difference found between groups for general psychopathology (GHQ-12), PTSD symptoms (PCL-C), or self-stigma (internal and external questions). However, history of minor disciplinary offense rates were significantly lower in the intervention group, suggesting better occupational functioning.
Watson and Andrews, 2018(39)	Same as above	693 police officers across 3 forces using TRiM, 166 police officers across 2 forces not using TRiM. Various local disasters, UK	Cross-sectional design, unspecified follow-up	The TRiM forces reported lower levels of PTSD symptoms (PCL-C), fewer barriers to help-seeking (Stigma and Barriers to Care Questionnaire), and reduced public stigma (MSS), than the non-TRiM forces.
Hunt et al, 2013(40)	Same as above	640 police officers: 44 given briefing, 44 given briefing and 1:1, 166 given 1:1, and 386 given no intervention. Exposure to mass shooting event in Cumbria, UK	Cross-sectional design, 2-month follow-up	The TRiM intervention program showed reduced occupation impact (absenteeism rates) when sociodemographic factors were adjusted, especially for junior officers. TRiM scores improved across time in the intervention group, although were significantly higher in the intervention group than control group at baseline and follow-up.

RCT = Randomized Controlled Trial; GHQ-28 =General Health Questionnaire-12; DASS-21 = Depression, Anxiety and Stress Scales – Short Form; IES-R = Impact of Event Scale – Revised; CD-RISC = Connor-Davidson Resilience Scale; MSPSS = Multidimensional Scale of Perceived Social Support; SSOSH = Self-Stigma of Seeking Help; EMDR-PRECI = EMDR Protocol for Recent Critical Incidents; PTSD = Post-Traumatic Stress Disorder; SPRINT = Short Post-Traumatic Stress Disorder Rating Interview; EMDR-PROPARA = EMDR Protocol for Paraprofessional Use; Brief-COPE = Brief-Coping Orientation to Problems Experienced; BRS = Bounce-Back to Resilience Scale; FMI = Freiburg Mindfulness Inventory; SCS-SF = Self-Compassion Scale – Short Form; CFQ = Cognitive Fusion Questionnaire; AAQ-II = Acceptance and Action Questionnaire; LOT-R = Life Orientation Test – Revised; SACL = Stress Arousal Checklist; PSS = Perceived Stress Scale; ProQOL = Professional Quality of Life; CSE = Coping Self-Efficacy Scale; PCL-C = PTSD Checklist-Civilian; MSS = Military Stigma Scale.

Summary of Study Characteristics

Six psychological intervention programs were identified across 12 studies (PFA, EMDR, APD, RAW, RCHC, and TRiM). The included programs were tested in frontline responder populations of medical and paramedic workers, firefighters, military forces, police officers, forensic workers, and other non-professionals trained to respond to emergency or disaster situations (see Table 1). Disaster contexts included Ebola,(34) human massacres,(32,40) military deployment,(37) car crash fatalities,(29) maritime collisions,(30) and other various local disasters.(30,31,33,36,38,39) There were five randomized controlled trials (RCTs),(30,31,33,35,38) four cross-sectional studies,(30,34,39,40) and three quasi-experimental designs.(32,36,37) Follow-up periods ranged from one week to 18 months (where specified). PFA, RCHC, APD, and RAW were classified as universal, EMDR was classified as selective/indicated in one study and early treatment in the other study, and TRiM was classified as a combination of universal and selective/indicative. PFA and RCHC interventions involved single treatment sessions, EMDR had single and multiple sessions, and APD, RAW, and TRiM had multiple sessions. EMDR and RAW were individual-level interventions, PFA and RCHC were group format interventions, and APD and TRiM were delivered across the whole organization.

The included studies used a variety of measures across the outcome domains of psychological distress (GHQ and DASS-21 for psychopathology; PSS and SACL for stress; IES-R, SPRINT, and PCL-C for PTSD; CFQ for cognitive fusion; AAQ-II for experiential avoidance) and positive psychological change (Brief-COPE, Ways of Coping, and CSE for coping; CD-RISC and BRS for resilience; LOT-R for optimism; FMI for mindfulness; SCS-FS for self-compassion; 6-item questionnaire for life satisfaction; ProQOL for quality of life). Additional outcomes included perceived stigma and barriers (MSS and internal and external stigma questionnaire for stigma; Stigma and Barriers to Care Questionnaire for barriers to help-seeking), perceived PFA knowledge (PFA knowledge questionnaire), and occupational functioning (history of minor disciplinary offence rates and absenteeism rates).

Early Psychological Intervention Programs

The following section provides a brief description of each early psychological intervention program included in this review, categorized as universal, selective/indicated, and/or early treatment.

Universal

Psychological first aid (PFA) is a widely used psychological program for disaster situations that provides access to emotional, social and physical support.(41) It aims to reduce short and long-term psychological effects of disasters and traumatic events through promoting adaptive functioning and coping. It also offers practical care and immediate support via empathic listening and information on psychosocial services. It is based on the concept of resilience and involves five empirically supported

disaster and mass trauma intervention principles, which include promoting a sense of (a) safety, (b) calming, (c) self- and community-efficacy, (d) connectedness, and (e) hope.(41) It has eight core helping actions and goals that are described in Table 2.(42) PFA can be offered via group or individual format, in a single session.

Anticipate, plan, and deter (APD) responder risk and resilience model aims to assess and manage psychological risk and resilience in healthcare workers and their families across pre-incident, response, and recovery stages of public health emergencies.(34) Specifically, the APD model consists of a three-step action plan, with the 'anticipate' phase involving pre-event stress inoculation training to prepare healthcare personnel for the psychosocial impact of mass trauma events. In the 'plan' phase, staff develop a personal resilience plan, where they can identify and document their expected stress responses and challenges as well as support systems and coping strategies. The final 'deter' phase involves teaching staff how and when to activate their personal resilience plan during stress exposure and encouraging them to use the Psychological Simple Triage and Rapid Treatment–Responder (PsySTART-R) self-triage system. PsySTART-R is a web-based mobile-friendly application and self-assessment tool that tracks daily exposure to traumatic stress, assesses psychological risk factors, and gives confidential feedback. The APD model targets the whole organization over time.

Resilience at work (RAW) mindfulness program, renamed recently to Mindarma, is an online intervention designed to increase resilience in high-risk workers, such as first responders.(35) The RAW is an evidence-based program that combines principles from mindfulness, cognitive-behavioural therapy (CBT), acceptance and commitment therapy (ACT), and self-compassion approaches. Specific strategies covered across the program target mindfulness, resilience, unhelpful thoughts, avoidance, personal values, self-care, and compassion. The content is delivered individually via internet format. The original program runs for 6 sessions of 20 to 25 minutes each and the revised current version is 10 sessions of 15 minutes each. There is a minimum 3-day break in between sessions to enable skills practice. Sessions include interactive exercises, audio-recordings, and animations. Four half-hour group webinars delivered by a senior psychologist are available in conjunction to the program, to encourage engagement and motivation of users. Moreover, the RAW (or Mindarma) program is an individual intervention with an optional group component.

Resilience and coping for the healthcare community (RCHC) is a recent post-disaster intervention designed to reduce psychological distress and increase resilience in healthcare and social service providers.(43) In particular, it aims to build healthy coping strategies for dealing with past, current, and future disasters and foster resilience through promoting support between colleagues. It combines psychoeducation and mindfulness practices in an interactive group-work format that uses solution-focused techniques and action learning theory. There are 5 core modules; common

reactions to stress, how the brain reacts to severe stress and trauma, healthcare provider responses to stress and traumatic events, coping with stress and trauma with individual strategies, and coping with stress and trauma with collective strategies. RCHC is delivered as a single group session.

Selective/Indicated or Early Treatment

Eye movement desensitization and reprocessing (EMDR) is a psychotherapy treatment designed to alleviate PTSD and other trauma-related symptoms.(44) EMDR was developed based on the theoretical framework of Adaptive Information Processing (AIP), which assumes that trauma symptoms arise from adverse life events being inadequately processed within the brain and stored as traumatic memories that continue to resurface.(45) In this intervention, a trained EMDR practitioner guides the person to relive their original trauma memory in brief doses whilst making rapid eye movements, instead of the memory being locked in the nervous system in the form of thoughts, emotions, and sensory information about the episode.(46) EMDR has sub-protocols for early intervention in the immediate days and weeks following disaster events, such as the protocol for recent critical incidents (PRECI),(47) group traumatic episode protocol (G-TEP),(48) and recent traumatic episode protocol (R-TEP).(49) It can be delivered in single or multiple sessions, either individually or as a group.

Universal and Selective/Indicated

Trauma risk management (TRiM) is a well-established peer support intervention for first responders that aims to mitigate psychological risk from potentially traumatic events by identifying high risk individuals and matching them to the appropriate care.(50) Participation is voluntary and careful consideration is made regarding who it is offered to. Trained management personnel first hold a planning meeting with everyone involved in the potentially traumatic event, to better understand the incident and agree upon a tailored response. In the next stage, TRiM practitioners run basic psycho-educational briefings to cover the specific incident as well as how to manage responses. Lastly, high-risk individuals are asked to take part in a semi-structured risk assessment interview and are linked with appropriate psychological support. Essentially, TRiM provides a framework for organizations to monitor and effectively manage the psychological impact of potentially traumatic events in their employees, through a whole organization stepped-care intervention.

Healthcare Service Evaluation Framework

The following section evaluates each program within the healthcare workforce, based on the criteria of effectiveness, content applicability, and feasibility with this population. A snapshot summary of the objective, content, endorsements, effectiveness, feasibility, and overall suitability for healthcare settings is summarized in Table 2 below.

Table 2. Snapshot summary of the six early psychological intervention programs

Intervention	Objectives	Endorsements and Effectiveness	Content	Feasibility	Suitability for HCWs
Universal Interventions					
PFA	Promotes adaptive functioning and coping in all disaster victims by providing access to information and support	Endorsed by the WHO and APS for general crisis support; suggested by 2 empirical studies as suitable for frontline workers, another empirical study had mixed findings	Based on 5 trauma intervention principles and 8 core actions or goals (contact/ engagement; safety/ comfort, stabilization, assess needs, practical assistance, social support, coping strategies, link with appropriate services)	Deliverable by non-professionals; single session; individual or group; free guides online and in-person or online training course at a cost (see Textbox)	**Effectiveness: 3 studies** **Content applicability: ✓** **Feasibility: ✓**
RCHC	Seeks to mitigate post-disaster distress and build resilience in HCW and social service providers	Recently implemented in response to several natural disasters in the USA; one empirical study; funded by AmeriCares	Based on the risk and resilience framework; combines psycho-education, group work, and mindfulness into 5 core modules	Requires trained RCHC facilitator; single session; group; free facilitator guide online (see Textbox)	**Effectiveness: 1 study** **Content applicability: ✓** **Feasibility: ✓**
APD	Assess and manage psychological risk and resilience in HCW at pre/during/post stages of disaster	Evaluated in one recent study and currently undergoing evaluation in West China Hospital and Minnesota, USA during COVID-19	Involves stress inoculation training, building a personal resilience plan, and activating plan whilst using the PsySTART-R self-triage system	Requires whole organization to implement and monitor over time; free instructor guide online (see Textbox)	**Effectiveness: 1 study** **Content applicability: ✓** **Feasibility: ✓**
RAW	Aims to target resilience in high-risk workers such as first responders	Used by several frontline teams across eastern states of Australia (ambulance, corrective services, health); one empirical study	Based on mindfulness and self-compassion training; involves 6 (now 10) brief individual sessions via an interactive e-learning program	Multiple session; individual; purchase from Mindarma website (see Textbox), scaled pricing based on number of users	**Effectiveness: 1 study** **Content applicability: ✓** **Feasibility: ✓**
Selective/Indicated or Early Treatment					
EMDR	Targets trauma-related symptoms in all trauma victims by guided reliving of trauma memory	Endorsed as a trauma intervention by the WHO, APS, and APA, amongst others; two empirical studies found reduced PTSD in frontline workers	Based on adaptive information processing (AIP) model and reprocessing of trauma memory in brain; has 8-phase treatment structure	Requires trained EMDR practitioner; single or double session; individual or group; free sub-protocols online, overall manual at a cost (see Textbox)	**Effectiveness: 2 studies** **Content applicability: ✓** **Feasibility: ✓**
Universal and Selective/Indicated					
TRiM	Peer support intervention for first responders that identifies high risk individuals and matches them to appropriate care	Developed for the British police force and military, now recommended as peer-support initiative across UK; mixed empirical evidence	Based on trauma-informed care principles and involves stepped management phases	Whole organization; volunteers trained as TRiM practitioners (2-day course). Free handbooks for trauma victims (see Textbox), no practitioner manual online	**Effectiveness: 4 studies** **Content applicability: ✓** **Feasibility: ✓**

HCW = HealthCare Workers. WHO = World Health Organization; APS = Australian Psychological Society; APA = American Psychiatric Association.

Psychological first aid (PFA)

Effectiveness. Despite being one of the most widely known and used programs in the general community(51) as well as endorsed by the World Health Organization(52) and Australian Psychological Society,(53) PFA has limited empirical evidence.(54) To our knowledge, there has been no empirical study in which frontline workers were the direct recipients of PFA after a trauma event. However, three studies reported on the mental health benefits to frontline workers after receiving a single day of training in PFA delivery (see Table 2). Psychological benefits were reported in medical staff(31) and other professional and non-professional first responders.(30) These benefits included improvements in positive psychological outcomes of resilience, self-efficacy, perceived knowledge, and social support. Reduced perceived self-stigma was also found. There was no evidence for change in general psychopathology, coping, or life satisfaction in the intervention group, although controls showed increased general psychopathology over time. The authors suggest that PFA brings psychological benefits for the person delivering it, in addition to their recipients, as it teaches coping strategies and facilitates connection with support systems and services, which can be used to protect the self as well as support others.

Content applicability. PFA is a generic disaster relief approach that can be implemented either during or immediately after the disaster and can apply to anyone impacted by the event. Its broad-spectrum response strategy makes it easily generalizable to multiple population groups and settings with a variety of psychological needs. It allows for local adaptations, thus is suitable for healthcare workers.

Feasibility. PFA training typically runs for a single day. Specialized mental health practitioners are not required to deliver PFA, although it assumes that trainees have basic knowledge in helping distressed individuals. Short training courses in delivering PFA are available and costs are variable, but can be minimized through group training, train the trainee schemes, and online training (see Textbox).

Eye movement desensitization and reprocessing (EMDR)

Effectiveness. Despite continuous skepticism from the scientific community,(55) EMDR is steadily becoming a popular and well-established intervention for treating trauma-related symptoms.(56) It is universally endorsed by the World Health Organization,(57) amongst others.(27,58,59) Reduced PTSD symptoms have been found across forensic personnel and first responders receiving EMDR.(32,33) Given that frontline workers across healthcare, forensic, and first responder populations are frequently exposed to traumatic events and are prone to experience secondary

traumatization,(4) EMDR may also be applicable for treating trauma-related symptoms in healthcare providers.

Content applicability. The Protocol for Paraprofessional use in acute trauma situations (PROPARA) was developed as an early EMDR intervention for first responders.(33) Like other early intervention models, it follows the same eight-phase structure as the standard treatment protocol,(60,61) yet differs in the specific processing techniques used and how the traumatic episode is conceptualized.[29,40] PROPARA would need no further adaption for use with healthcare workers who experience trauma or disaster events. Other early EMDR protocols may also potentially be adapted to support the needs of the healthcare workforce.

Feasibility. Early EMDR intervention typically lasts for a couple of hours, whereas the standard intervention spans across several days. An EMDR practitioner with specialist training must deliver EMDR therapy to ensure correct delivery, making it a costly treatment. There are several early EMDR intervention protocols available online (see Textbox).

Anticipate, plan, and deter (APD) responder risk and resilience model

Effectiveness. There is limited evaluation of the APD model in the literature. In one recent study, however, the full APD model was implemented in medical providers during the Ebola crisis, who showed reduced psychological risk factors across time.(34) The APD model is part of a two-stage psychological rehabilitation plan currently underway in West China Hospital, which seeks to prevent further psychological impact of COVID-19 on healthcare workers. It is also part of a larger psychological intervention study for healthcare organizations to provide to their staff during the COVID-19 pandemic, currently undergoing evaluation in Minnesota.(62) Whilst research on the APD model is in its infancy, it has shown promising effectiveness in healthcare workers.

Content applicability. The APD model was explicitly intended as a psychological intervention for healthcare workers, with theoretical frameworks of risk and resilience tailored to suit this population. Therefore, its content is already applicable to healthcare settings.

Feasibility. The APD risk and resilience model requires the organization to implement the system throughout all stages of disaster response and regularly monitor risk. Therefore, it is relatively resource intensive compared to other programs, as it requires continuous management over time. See Textbox for a full instructor guide.

Resilience at work (RAW) mindfulness program

Effectiveness. The RAW program shows promising preliminary results, with a recent empirical study finding improved positive mental health outcomes of resilience and active coping in a group of full-

time firefighters at post-treatment.(35) This study also provided evidence for increased optimism and use of support, but no evidence for change in bounce-back resilience, mindfulness, self-compassion, cognitive fusion, or experiential avoidance. The program, now called Mindarma and adapted to run for 10 sessions, has been adopted by several frontline organizations in the eastern states of Australia including ambulance, corrective, and health services. The program is also fully endorsed by the Black Dog Institute – a not-for-profit organization and world leader in mental health services and research.

Content applicability. The RAW program was designed to protect the well-being of high-risk workers through resilience training. The program can be tailored to the unique needs of the workforce, through customization of content such as scripts, animations, and programming. Therefore, it appears suitable for healthcare professionals in high-risk workplaces.

Feasibility. The online RAW (or Mindarma) program can be implemented quickly and easily at a low cost by contacting the owners of the program via their website (see Textbox). Pricing is scaled depending on the number of users in the organization and organization managers can receive face-to-face training workshops to ensure they are well informed.

Resilience and coping for the healthcare community (RCHC)

Effectiveness. The RCHC intervention has demonstrated some effectiveness at reducing psychological impact in healthcare workers, producing positive psychological outcomes of increased perceived knowledge and social support and decreased acute stress levels in a single study.(36) RCHC was recently implemented in several other areas also affected by natural disasters in the USA, such as typhoon-affected Saipan in 2015 and flood-affected Shreveport in 2017, and is currently undergoing evaluation as a recovery response strategy for Hurricane Harvey in Texas and Hurricane Maria in Puerto Rico, funded by AmeriCares.(43)

Content applicability. The RCHC uses a risk and resilience framework that has been carefully adapted for use with healthcare and social service providers by acknowledging the high-risk exposure of this workforce and the incorporation of appropriate strategies to build resilience.(43) RCHC contains suitable content for healthcare workers, as it was explicitly designed for this population.

Feasibility. The RCHC can be delivered to staff in three hours and a trained RCHC facilitator is required to deliver the intervention. There is no full manual available online (see Textbox).

Trauma risk management (TRiM)

Effectiveness. The TRiM program has mixed findings, with two studies showing reduced psychological impact in police and Army officers and one study showing no change in military

officers.(37–39,63) However, there is evidence to suggest it can reduce stigma and barriers to help-seeking as well as improve occupational functioning in these populations.(38–40)

Content applicability. Initially developed in the British military and used within police officers, TRiM is now used by many different organizations across the UK. It offers an evidence-based framework for early indication of who may go on to develop mental health symptoms after a traumatic event and how this should be managed to ensure the best conditions for psychological recovery. This framework is generic enough that it is also suitable for use in healthcare settings. The overlap in traumatic workplace experiences between healthcare and other frontline workers suggests that the TRiM program would show similar results in healthcare settings.

Feasibility. The TRiM program is intended to be delivered by volunteer personnel within the organization, ideally from a managerial position. TRiM practitioner courses typically run over two or more days. Several TRiM handbooks designed for trauma victims are available online (see Textbox).

DISCUSSION

The key objective of this paper was to equip healthcare service providers with practical information on how to protect the mental health of healthcare professionals during local and global disasters. Since the evidence-base for early psychological interventions within healthcare workers is limited and personnel on the frontline also face exposure to traumatic events, all frontline responders were considered in this review. Evidence was searched for early psychological interventions designed to prevent or reduce psychological harm and that were tested in frontline workers during recent disease outbreaks and disasters. Each included program was described and evaluated based on its suitability for rapid implementation among the healthcare workforce using the criteria of effectiveness, content applicability, and feasibility. This evaluation framework seeks to provide a current workplace mental health response guide for healthcare service providers.

Generally, the evidence-base was limited across all intervention programs. Six early psychological programs were identified across 12 studies, with four programs classified as universal, one classified as selective/indicated in one study and early treatment in another study, and one classified as both universal and selective/indicated, due to its stepped-care approach.(24) Out of the sparse number of studies, PFA, EMDR, and TRiM were tested in frontline responders across at least two studies each, in addition to being applicable and feasible for rapid implementation within the healthcare workforce (see Table 2). In particular, these interventions demonstrated improved psychological outcomes at follow-ups across two or more studies, with several increased positive psychological outcomes found with PFA(30,31), several reduced negative psychological outcomes found with TRiM(37,39,40) and reduced PTSD levels found with EMDR.(32,33) However, TRiM requires further research, due to inconsistent findings of effectiveness across various studies with frontline responders.(63) It is also important to note that the evidence-base for PFA involves frontline workers receiving training in PFA delivery rather than as direct recipients of the intervention.

The APD, RAW (or Mindarma), and RCHC programs are relatively new psychological interventions that have shown promising outcomes with frontline workers and appear to be potentially suitable interventions for rapid implementation among healthcare workers.(34–36) APD and RCHC were specifically intended for healthcare workers and RAW for high-risk workers, thus these programs have been tailored to suit this population and may be more appropriate than more generic approaches such as PFA and EMDR. Nevertheless, evidence for APD, RCHC, and RAW programs is limited to a single study each and only the RAW study included a control condition, thus further evaluation of these programs is required in order to strengthen their evidence-base. Tables 3.1-3.3 provide a summary of recommendations for evidence according to the ISTSS guidelines for

prevention (i.e., universal and selective/indicated) interventions and early treatment interventions with single or multiple sessions.(24) These tables indicate emerging evidence for PFA and TRiM and insufficient evidence for EMDR, APD, RCHC, and RAW, further suggesting the need for additional research on each intervention.

Table 3.1. Recommendations for single session prevention interventions
Intervention with emerging evidence – PFA
Intervention with insufficient evidence – RCHC
Table 3.2. Recommendations for multiple session prevention interventions
Intervention with emerging evidence – TRiM
Intervention with insufficient evidence – EMDR, APD, RAW
Table 3.3. Recommendations for early treatment
Intervention with insufficient evidence - EMDR

Emerging evidence = two or more studies, insufficient evidence = only one study. Recommendations based on recent ISTSS guidelines.(24)

Several promising early psychological interventions did not meet eligibility requirements for this review, yet deserve mention. Firstly, immediate cognitive-functional PFA (ICF-PFA) was recently proposed as an improved, structured, and more immediate disaster relief approach to PFA that targets symptoms of the acute stress reaction by drawing on psychological theories of stress and resilience.(29) ICF-PFA is recognized as the national PFA model by the Israeli Ministry of Health and has been adopted by several frontline sectors, with the Israeli Defence Forces currently investigating its impact in frontline soldiers. However, this intervention was excluded as it has only been empirically tested in trauma-exposed adolescent students and requires formal evaluation in frontline staff. In addition, a computer-assisted resilience training program given to Canadian healthcare workers during the SARS outbreak found positive psychological impact at post-treatment, but was excluded from this review due to lack of a follow-up measurement.(64) A recent digital learning package targeting psychological well-being showed good user satisfaction of healthcare workers across the UK during COVID-19 but was also excluded as it used qualitative analysis only.(65) A study testing a stress management and resilience training program in medical physicians was also excluded due to absence of disaster situations.(66) Finally, study protocol is available for an 8-week online CBT program designed for healthcare workers that is currently undergoing evaluation in the context of COVID-19 in France.(67) Future research should explore these potential alternative interventions, in addition to those included in this review.

Empirical research on the effectiveness of early psychological interventions for preventing or reducing post-traumatic and other mental health symptoms in healthcare and other frontline workers is limited, with few RCTs available and most interventions targeting community disaster victims. One alternative is to compare the findings of this paper with literature on early psychological interventions tested in other trauma-exposed populations. Recent systematic reviews suggest that early EMDR and trauma-focused CBT are amongst the most effective individualized programs for targeting trauma-related symptoms,(68,69) yet more evidence is still needed on these interventions.(70) PFA is also recommended as an early intervention for trauma victims,(51) despite its lack of evidence in comparison to the other interventions.(54) This wider literature is consistent with the finding that PFA and EMDR are the most evidence-based early psychological interventions for frontline workers to date. To the best of our knowledge, there is currently no research on trauma-focused CBT for frontline responder populations. Nevertheless, it is recommended that anyone with severe or persistent trauma-related symptoms should seek out more intensive and longer-term individualized support, such as trauma-focused CBT.(11,17,18)

It is possible that several other suitable early psychological interventions exist for frontline workers, in addition to those mentioned above, that have not yet received formal evaluation. This is understandable given the chaotic nature of healthcare services when dealing with mass traumas and disasters. A potential limitation of this paper is that, due to the rapid need for a review in this area, only three databases were searched and a single reviewer assessed the articles. Even though the databases were chosen for their comprehensive coverage of medical and psychological research, it is possible that relevant studies were missed. Additionally, the ongoing character of the COVID-19 pandemic may induce longer periods of elevated traumatic stress in frontline workers compared to the acute trauma from local disasters and accidents, differentiating this context from previous disaster situations. Despite limitations, available past research with all frontline workers can still guide healthcare services in implementing early intervention programs that might proactively address the mental health fallout of the current COVID-19 crisis, as well as future pandemics and other mass health and trauma crises. This review has outlined several early interventions tested in frontline workers during disease outbreaks and other disasters, which also appear suitable for widespread implementation in the healthcare workforce.

Whilst the process and prioritization of research can be challenging in the context of mass trauma events, this is an essential area of development. Healthcare systems play a crucial role in evaluating the interventions they implement, in order to build the much needed evidence-base for preventing and reducing psychological impact in healthcare workers and elucidating best practices for services in managing future disasters. Healthcare services are typically vigilant to addressing the physical

safety of staff in the workplace and the psychological safety of staff must also be given equal priority. Indeed, healthcare services have a duty of care to equip their staff with support and psychological skills to assist with the mental health challenges they will inevitably face as part of their courageous frontline work they do for the benefit of the broader community, particularly during times of mass crises. This review of the evidence for early psychological interventions within frontline staff and the consideration of suitability for healthcare settings is intended to be a helpful resource to guide healthcare and other frontline services seeking to select an intervention to suit the needs of their organization and its employees.

Figure 1. Study flow diagram.

Textbox. **Links to more information on each included program.**

Psychological first aid (PFA)

- There are several free PFA guides available online. The World Health Organization(52) provides a guide in 30 languages, accessible via the link: https://www.who.int/mental_health/publications/guide_field_workers/en/
- The Australian Red Cross provides another PFA guide endorsed by the Australian Psychological Society,(53) accessible via the link: https://www.redcross.org.au/getmedia/dc21542f-16e4-44ba-8e3a-4f6b907bba6f/Psychological-First-Aid-An-Australian-Guide-04-20.pdf.aspx

Eye movement desensitization and reprocessing (EMDR)

- A comprehensive practice manual by Marilyn Luber(71) can be purchased online that contains models, scripted protocols, and summary sheets for early EMDR intervention.
- An overview and protocol manual is available for free for EMDR R-TEP(49): https://emdrresearchfoundation.org/toolkit/rtep-manual.pdf; for EMDR-PRECI(72): https://emdrresearchfoundation.org/toolkit/preci.pdf; and for EMDR G-TEP(73): https://emdrresearchfoundation.org/toolkit/gtep.pdf

The anticipate, plan, and deter (APD) responder risk and resilience model

- An instructor guide for the APD model with relevant worksheets(74) is freely available online: http://file.lacounty.gov/SDSInter/dhs/221064_AnticipatePlanandDeterInstructorManual-FINAL.pdf

Resilience at work (RAW) mindfulness program

- The RAW (now called Mindarma) program can be purchased via the website below(75), which contains information including pricing, media, workshops, and contact details: https://www.mindarma.com/home/
- More information can also be found on the Black Dog Institute website(76): https://www.blackdoginstitute.org.au/education-services/workplaces/workplace-programs/mindarma/

Resilience and coping for the healthcare community (RCHC)

- Whilst the full RCHC manual is not available online, the author can be contacted at: paula.yuma@colostate.edu and more information on each module(43) can be found at: https://digitalcommons.library.tmc.edu/jfs/vol19/iss1/8/

Trauma Risk Management (TRiM)

- Several TRiM handbooks designed for trauma victims are available online. For more information on TRiM training, see(77): http://www.marchonstress.com/page/p/trim_faqs
- TRiM handbook by the British Royal Navy(78): http://c69011.r11.cf3.rackcdn.com/d951c5627eb44b3789e84292d1e2c1fa-0x0.pdf
- TRiM handbook by the UK Hampshire Fire and Rescue Service and Hampshire Constabulary(79): https://documents.hants.gov.uk/corprhantsweb/Traumahandbook.pdf

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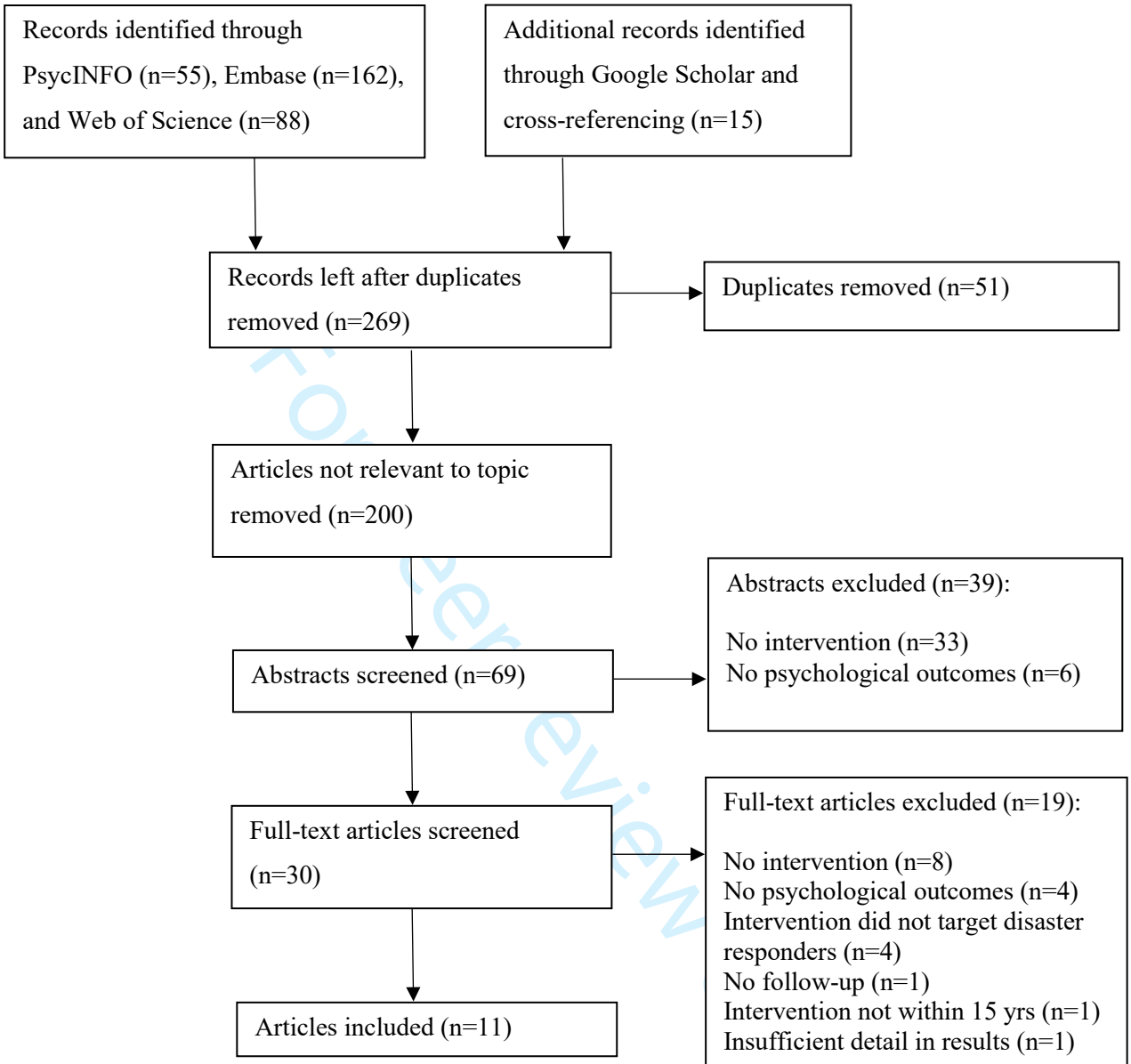

Reporting checklist for systematic review and meta-analysis.

Based on the PRISMA guidelines.

Instructions to authors

Complete this checklist by entering the page numbers from your manuscript where readers will find each of the items listed below.

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		Reporting Item	Page Number
Title			
	#1	Identify the report as a systematic review, meta-analysis, or both.	1
Abstract			

Structured summary	#2	Provide a structured summary including, as applicable: background; objectives; data sources; study eligibility criteria, participants, and interventions; study appraisal and synthesis methods; results; limitations; conclusions and implications of key findings; systematic review registration number	2
Introduction			
Rationale	#3	Describe the rationale for the review in the context of what is already known.	4
Objectives	#4	Provide an explicit statement of questions being addressed with reference to participants, interventions, comparisons, outcomes, and study design (PICOS).	5
Methods			
Protocol and registration	#5	Indicate if a review protocol exists, if and where it can be accessed (e.g., Web address) and, if available, provide registration information including the registration number.	5
Eligibility criteria	#6	Specify study characteristics (e.g., PICOS, length of follow-up) and report characteristics (e.g., years considered, language, publication status) used as criteria for eligibility, giving rational	7
Information sources	#7	Describe all information sources in the search (e.g., databases with dates of coverage, contact with study authors to identify additional studies) and date last searched.	6

Search	#8	Present full electronic search strategy for at least one database, including any limits used, such that it could be repeated.	6
Study selection	#9	State the process for selecting studies (i.e., for screening, for determining eligibility, for inclusion in the systematic review, and, if applicable, for inclusion in the meta-analysis).	6,7
Data collection process	#10	Describe the method of data extraction from reports (e.g., piloted forms, independently by two reviewers) and any processes for obtaining and confirming data from investigators.	6,7
Data items	#11	List and define all variables for which data were sought (e.g., PICOS, funding sources), and any assumptions and simplifications made.	6,7
Risk of bias in individual studies	#12	Describe methods used for assessing risk of bias in individual studies (including specification of whether this was done at the study or outcome level, or both), and how this information is to be used in any data synthesis.	6
Summary measures	#13	State the principal summary measures (e.g., risk ratio, difference in means).	6
Planned methods of analysis	#14	Describe the methods of handling data and combining results of studies, if done, including measures of consistency (e.g., I2) for each meta-analysis.	6

Risk of bias across studies	#15	Specify any assessment of risk of bias that may affect the cumulative evidence (e.g., publication bias, selective reporting within studies).	6
Additional analyses	#16	Describe methods of additional analyses (e.g., sensitivity or subgroup analyses, meta-regression), if done, indicating which were pre-specified.	6
Results			
Study selection	#17	Give numbers of studies screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally with a flow diagram.	8
Study characteristics	#18	For each study, present characteristics for which data were extracted (e.g., study size, PICOS, follow-up period) and provide the citation.	9-11
Risk of bias within studies	#19	Present data on risk of bias of each study and, if available, any outcome-level assessment (see Item 12).	8
Results of individual studies	#20	For all outcomes considered (benefits and harms), present, for each study: (a) simple summary data for each intervention group and (b) effect estimates and confidence intervals, ideally with a forest plot.	9,10
Synthesis of results	#21	Present the main results of the review. If meta-analyses are done, include for each, confidence intervals and measures of consistency.	14

Risk of bias across studies	#22	Present results of any assessment of risk of bias across studies (see Item 15).	8
Additional analysis	#23	Give results of additional analyses, if done (e.g., sensitivity or subgroup analyses, meta-regression [see Item 16]).	15-18
Discussion			
Summary of Evidence	#24	Summarize the main findings, including the strength of evidence for each main outcome; consider their relevance to key groups (e.g., health care providers, users, and policy makers	19
Limitations	#25	Discuss limitations at study and outcome level (e.g., risk of bias), and at review level (e.g., incomplete retrieval of identified research, reporting bias).	21
Conclusions	#26	Provide a general interpretation of the results in the context of other evidence, and implications for future research.	21,22
Funding			
Funding	#27	Describe sources of funding or other support (e.g., supply of data) for the systematic review; role of funders for the systematic review.	24